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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SPECIFICATION

MEDIUM INTENSITY AIRPORT WEATHER SYSTEM (MIAWS)

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TABLES - To be supplied later, when the document is more mature.

FIGURES - To be supplied later, when the document is more mature.

1 INTRODUCTION

1.1 Background

The Federal Aviation Administration (FAA) has established a need, as stated in the Integrated Terminal Weather System (ITWS) Mission Need Statement (MNS) 234, for weather detection, display of precipitation intensity, and real-time storm motion with projected position at Air Traffic Control Tower (ATCT) facilities. This capability will used to alert Air Traffic Control (ATC) to the severity, location, movement, and expected duration of hazardous weather events. Weather occurring in and around airport operational areas has had a significant negative impact on safety and efficiency of aircraft operations. This specification establishes the functional and performance requirements for the Medium Intensity Airport Weather System (MIAWS).

Medium intensity airports, which are defined by the number of ATC operations conducted and the number of hazardous weather days experienced, have typically been provided with limited weather detection and alert capabilities, such as Low Level Wind Shear Alert System (LLWAS). While providing wind shear warnings, LLWAS does not provide ATC with a display of precipitation or storm motion and predicted storm track. High-intensity airports have received the ITWS, Terminal Doppler Weather Radar (TDWR) or Weather Systems Processor (WSP) systems, which are technically advanced and costly weather display systems. Medium intensity airports fall short of the operational threshold used to designate high-intensity airports but still need displayed weather data. Using available weather data, MIAWS provides enhanced capabilities to medium-intensity ATCTs and at significantly less cost than the systems at high-intensity airports.

In early 2000, a low-cost proof-of-concept MIAWS was installed and tested at Memphis International Airport, Memphis, Tennessee. This system demonstrated the effectiveness of using available technology to display calibrated precipitation intensity products and storm motion information. Based on the proof-of-concept system and lessons learned from that effort, a prototype was developed and is currently in operation at the Jackson International Airport, Jackson, Mississippi. This prototype matched Next Generation Radar (NEXRAD) weather data to runway approach and departure corridors, terminal airspace arrival and departure areas, and traffic flow patterns. MIAWS will enable better situational awareness of hazardous weather in the terminal area and will help ATC Operational Supervisors to confidently plan and safely manage the flow of air traffic with fewer delays during thunderstorm activities.

1.2 Acquisition Approach

Advancements in technology have made possible the use of Commercial-Off-the-Shelf (COTS)/Non-Developmental Item (NDI) components and software to meet the requirements for MIAWS. Use of COTS/NDI will be maximized during the acquisition of MIAWS.

1.3 Operational Concept

1.3.1. General

MIAWS displays hazardous weather direction, speed, and extrapolated storm front predicted positions for six levels of precipitation intensity. MIAWS provides specific prediction alert capabilities for precipitation intensity as well as associated video maps. MIAWS automatically generates these weather products derived from NEXRAD. MIAWS and its user interface share commonality of appearance and operation with other weather system displays (e.g., ITWS, TDWR, and WSP), to give these FAA Integrated Weather Product Line systems a common user interface that facilitates operator training and relocation.

1.3.2 Operational Use

ATC personnel need time-critical hazardous weather alerts, routine weather observations and short-term terminal area forecasts (up to 30 minutes). ATC operational supervisors will use MIAWS to access weather information on high-resolution, full-color graphic displays that are readable both in direct sunlight and in a darkened room. The MIAWS display will be capable of being installed on a tabletop, a console, a rack, or mounted overhead. The MIAWS displays are to be positioned throughout the ATCT, typically in the tower cab and the Terminal Radar Approach Control (TRACON).

MIAWS provides the capability to manage the flow of ground and air traffic based on the ten- and twenty-minute precipitation predictions. The predictions increase weather awareness and help operational supervisors understand the current and near-term terminal area severe weather impact, to allow efficient management and planning of air traffic operations. MIAWS will contain site-specific adaptation information when it the system is installed. Examples of site adaptation information include: protected airport runway location(s), and warning message format.

MIAWS enables operational supervisors to locate and predict the near-term location of hazardous weather to improve operational decision-making on runway usage, opening and closing of runways and arrival/departure transition areas, and holding patterns. MIAWS can accurately locate, in time and space, operationally significant weather and display that information in a consistent and timely manner to support operating decisions for optimum safety, capacity, and efficiency of the National Airspace System (NAS). MIAWS presents operational supervisors with weather information that is tailored to their operational needs and that require minimal interpretation and offers maximum utility at a glance, with minimal unwanted information or clutter.

MIAWS provides more efficient planning of aircraft movements in the terminal area by significantly improving local-area weather data quality and timeliness. Identification of weather that affects specific approach and departure corridors, cornerposts, runways, and the airport surface, will enable more efficient coordination of routing strategies. Operational supervisors will be able to anticipate, rather than just react to, weather and will be able to coordinate the movement of traffic through alternate arrival and departure routes, to increase capacity. The ability to anticipate the effect of weather, such as cessation of significant weather in an area, select optimal routes, or decide upon a holding strategy prior to aircraft arrival in an area, will save time and aircraft fuel. The improved quality of information for near-term weather hazards will also improve the margin of safety while sustaining higher capacity.

Operation supervisors depend largely upon radar data and pilot reports for storm information. Currently, the information at their disposal requires interpretation and does not depict projected storm movement and characteristics. Storm cells in the area frequently move independently and are affected by local topography and bodies of water, which without local real-time storm analysis makes prediction of their impact unreliable. MIAWS provides both improved precipitation products and storm information, reduces the need for interpretation of radar-only information, and promotes more efficient planning of air traffic management. Consistent with MIAWS display of precipitation products, multiple ranges or views of storm information will display current position, movement, and characteristics, to improve inter-facility coordination. The storm motion product helps operators better anticipate the impact of storms on traffic patterns, perform trade-offs necessary to adjust these patterns, and significantly improve capacity while maintaining the required high level of safety.

The following example illustrates how an ATC operational supervisor will use MIAWS, and specific benefits that arise from its use:

> MIAWS indicates that a large area of weather (thunderstorms) is moving into XYZ terminal area. The XYZ operational supervisor observes that the northwestern (NW) arrival and departure transition areas will be closed within the next 20 minutes due to thunderstorm activity. Within this time frame, the NW arrival transition area is expecting 17 inbound aircraft and the NW departure area is expecting 14 outbound aircraft. The operational supervisor calls the Air Route Traffic Control Center (ARTCC) to request that all 17 inbound aircraft be re-directed to an alternate northeastern (NE) arrival transition area and that XYZ facility will vector the 14 departures to the NE departure transition area to avoid the severe weather (thunderstorms).
>
> In this scenario the operational supervisor was continually updated by MIAWS as the weather moved into the XYZ terminal area. MIAWS indicated that within 20 minutes the west runways at the airport would be closed due to heavy precipitation associated with the thunderstorms. The operational supervisor re-directed all arriving and departing aircraft to the appropriate east runway, thus allowing the aircraft to avoid the weather. The data provided by MIAWS gave the operational supervisor the knowledge that the hazardous weather would clear the west runways and move over the east side within another 10 minutes. This knowledge allowed the next group of aircraft to be re-positioned for earlier resumptions of takeoffs and landings on the west side of the airport.
>
> In this scenario, MIAWS provided ATC with the real-time critical hazardous weather information they needed to safely and efficiently manage the flow of air traffic. The operational supervisor was able to safely move air traffic with minimal delays around the XYZ terminal area. The net reduction of delays for aircraft inbound and outbound reduced the occurrence of missed connections and associated costs to the airlines and to passengers. Unnecessary diversions were avoided when flight crews were advised that airport runways would re-open before

holding periods expired, reducing the occurrences of unnecessary diversions to alternate airports. The improved ability to anticipate the end of severe weather allowed for earlier lifting of national ground stop programs.

In this scenario, MIAWS predicted projection of the arrival of the thunderstorm and its associated heavy precipitation and its effect on the airport and its operations, allowing operators to give priority of arrivals over departures. The result was reduced airborne delays at the expense of somewhat greater, but less costly, ground delays. Knowing that different areas of airspace and runways would be unusable allowed the operational supervisor to more efficiently distribute traffic flow into and out of the terminal area, thus avoiding unnecessary aircraft re-routes. The associated payoffs for the NAS were better Severe Weather Avoidance Plan (SWAP) anticipation, higher airport arrival rates, fewer gate holds, fewer aircraft diversions, and better anticipation of airport shutdowns and reopening due to thunderstorms.

1.4 MIAWS Data Distribution Overview

The relationship among input elements, the MIAWS processor, and displays for use by various users, as implemented in the MIT/LL MIAWS Prototype, is shown in Figure 1-1, the MIAWS Data Distribution Overview.

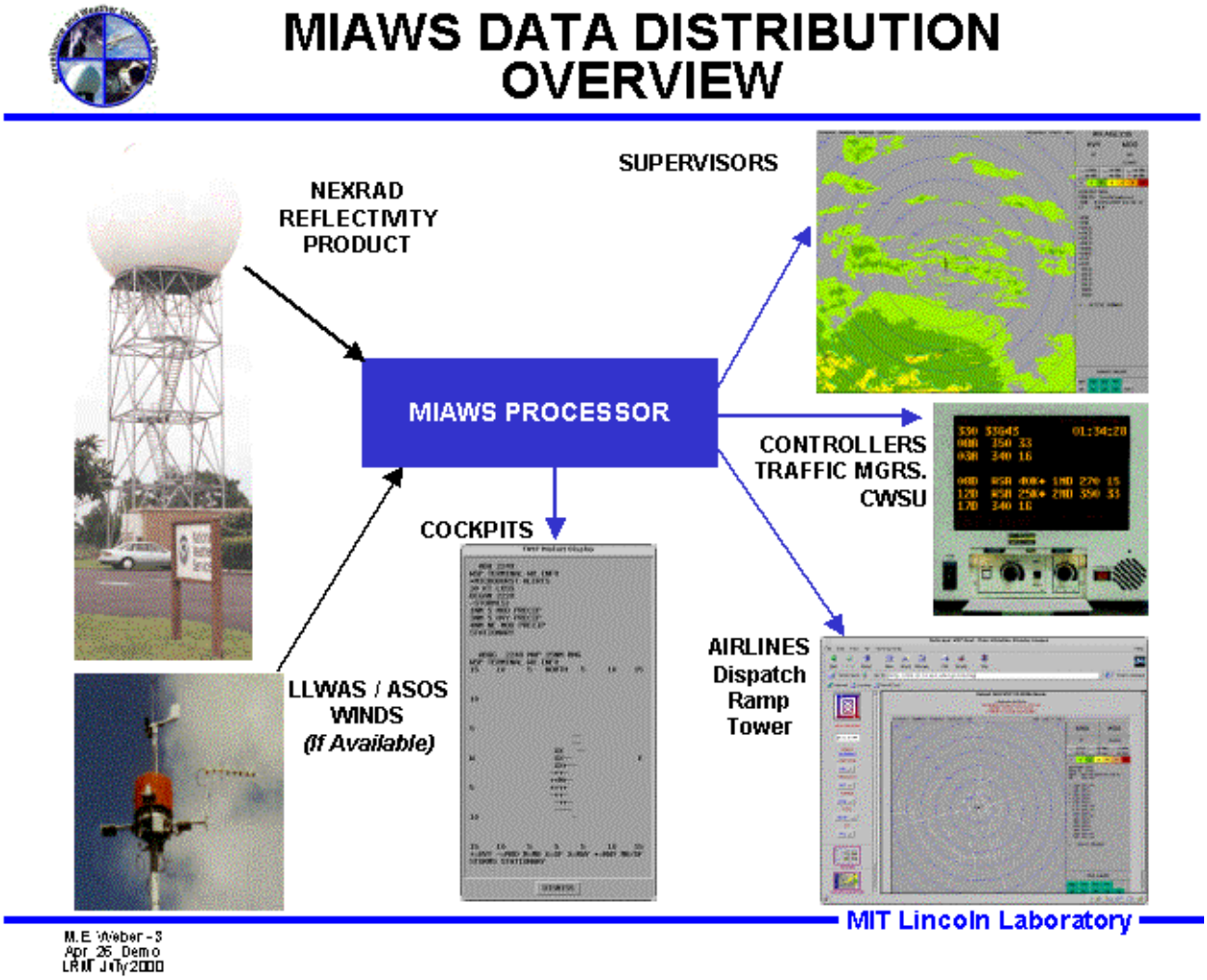

Figure 1-1: MIAWS Data Distribution Overview

1.5 MIAWS Functional Areas

The MIAWS system is divided into the following major functional areas:

(a) Data Acquisition (DA).

(b) Data Processing (DP).

(c) Display Function (DF).

(d) System Control/Diagnostic Function (SC/DF).

1.5.1 DA Function

The DA function will be responsible for automatically receiving data and products from external systems and certain end-users (i.e., runway configuration from supervisor SD).

1.5.2 DP Function

The DP function will be responsible for data translation, product generation, and data archiving..

1.5.3 Display Function

The DF is hosted in COTS processors at the Air Traffic Control Tower (ATCT) and Terminal Radar Approach Control (TRACON) facility. The DF performs graphic display of airport maps, airport specific runways, and weather images; provides runway control designation to air traffic controller supervisors; and provides runway specific weather product alarms and alerts to air traffic controllers.

1.5.4 SC/DF Function

MIAWS will contain a capability for system status monitoring, reporting, and error diagnosis. The SC/DF, through the Maintenance Display Terminal (MDT), is also the entry port for entering system control commands and site adaptable data.

1.6 Products

The main products are Precipitation, Storm Motion and Extrapolated Storm Position, MIAWS Alerts, and Runway Configuration.

1.7 Government Furnished Information and Government Furnished Property

The Government will provide, as Government Furnished Information (GFI), software to detect and generate, as appropriate, precipitation, storm motion, and extrapolated storm position to generate and display MIAWS alerts, and ancillary functions necessary for the operation of MIAWS. This software consists primarily of the computational procedures used to derive hazardous weather information from acquired sensor data or products produced from sensor data, as manifested on the MIT/LL MIAWS prototype. Further, the algorithms that perform the processing referenced in Section 3.1.2 (and its subsections) and Section 30 of this specification are Government Furnished Property (GFP), are to be used by the Contractor in the fly-off and production versions of MIAWS, and are not to be modified. The Government will supply measured weather data sets, model weather events, and a NEXRAD simulator to the Contractor to use in system/software validation and testing.

1.8 Output from GFI Software

The outputs of the GFI software are products that are either graphical, alphanumeric, an alarm, or a combination of these. The format of the graphical and alphanumeric output is defined in the GFI software and associated documentation and is similar to the graphical and alphanumeric output of WSP and TDWR. Specific Display and alphanumeric requirements for MIAWS are defined in Appendix C.

a. Graphical product output may be a pseudomap showing the location, extent, and perhaps magnitude of a phenomenon or a symbol showing only the location.

b. Alphanumeric product output is displayed on the SD, for the supervisory controllers and traffic management unit specialists to use in developing traffic control strategies.

c. Some of the output data will be in the form of alarms, which, in this context, are visual warnings of a weather hazard that was not previously reported as being hazardous, in a region of concern to pilots and Air Traffic Control (ATC) personnel.

1.9 Pre-Planned Product Improvements

Pre-Planned Product Improvements are under consideration for incorporation into the end product, and may include products such as, or similar to, the following:

1) ASR-11 Interface. The MIAWS could use ASR-11 data to ingest into algorithms to produce weather products.
2) Gust Front (NEXRAD Upgrade)
3) Open Radar Product Generator (ORPG) (NEXRAD Upgrade)
4) Website Interface to provide data to External Users
5) TWIP Interface. Through a MIAWS interface to Terminal Weather Information for Pilots (TWIP), the MIAWS SD images and runway weather product alert messages can be provided directly to in-flight pilots on their cockpit displays.

2 APPLICABLE DOCUMENTS

The following documents form a part of the specification to the extent specified herein. The latest version of these documents as of the contract date applies. In the event of a conflict between requirements, the following order of precedence (highest = a) applies:

a. Executive Orders
b. Federal Regulations
c. This specification and its appendices
d. FAA Specifications and Standards
e. FAA Orders
f. FAA Plans
g. Military Standards
h. Federal Standards
i. Non-Government Documents

2.1 Government Documents

EXECUTIVE ORDERS:

Executive Order 12196 Occupational Safety and Health Program for Federal Employees

FEDERAL REGULATIONS:

29 CFR 1960 Safety and Health Provisions for Federal Employees

SPECIFICATIONS:

Federal Aviation Administration

FAA-C-1217	Electrical Work, Interior
FAA-G-2100F	Electronic Equipment, General Requirements
NAS-SR-1000	NAS Systems Requirement Specification

STANDARDS:

Federal Aviation Administration

FAA-STD-019	Lightning Protection, Grounding, Bonding and Shielding Requirements for Facilities
FAA-STD-020a	Grounding, Transient Protection and Shielding Requirements for Equipment

FAA-STD-029d	Selection and Implementation of Telecommunications Standards

Federal

FED-STD-795	Uniform Federal Accessibility Standards

Military

MIL-STD-280	Definitions of item Levels, Item Interchangeability, Models and Other Related Items
MIL-STD-973	Configuration Management
MIL-STD-1388-2	DOD requirements for a Logistic Support Analysis Record

OTHER PUBLICATIONS:

DOT H 1350	Information Systems Security Guide
DOT H 1350.251	Network Security Guide
DOT/FAA/ACT-96/1	Human Factors Design Guide
DOT/FAA/AR-99/52	Human Factors in the Design and Evaluation of Air Traffic Control Systems
DOT/FAA/ND – 95/11	Terminal Weather Information for Pilots (TWIP)
DOT-VNTSC-FAA-95-3	Human Factors in the Design and Evaluation of Air Traffic Control Systems
FAA Order 1370.82	Information Systems Security Program
FAA Order 1600.69	Facility Security Risk Management Program
FAA Order 3900.19B	Occupational Safety and Health
FAA Order 4441.16	Acquisition of Telecommunications Systems, Equipment and Services
FAA Order 6000.15	General Maintenance Handbook for Airway Facilities
FAA Order 6000.30	National Airspace System Maintenance Policy
FAA Order 6000.36	Communications Diversity
FAA Order 6030.20	Electric Power Policy
FAA Order 6950.2	Electrical Power Policy Implementation, NAS Facilities
FAA Order 6950.25	Power Conditioning Devices at FAA Facilities

National Airspace System

NAS-IR-	Interface Requirements Document, MIAWS/NEXRAD
NAS-IR-	Interface Requirements Document, MIAWS/LLWAS-II
NAS-IR-	Interface Requirements Document, MIAWS/IDS ***[????]***

Department of Commerce, National Oceanic and Atmospheric Administration, Office of the Federal Coordinator for Meteorological Services and Supporting Research

FCM-H11C-1991 Federal Meteorological Handbook No. 11, Doppler Radar Meteorological Observations, Part C, WSR-88D [NEXRAD] Products and Algorithms

Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service

Advisory Circular AC-00-45, Section 7, Aviation Weather Services

2.2 Non-Government Documents

ANSI/ASQC Q9001-1994	American National Standard, Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation, and Servicing.
ISO 9000-3	Quality management and quality assurance standards - Part 3: Guidelines for the application of ISO 9001 to the development, supply and maintenance of software.

Electronic Industries Association (EIA)

EIA-530	High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Termination Equipment
RS-232	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange

Institute of Electrical and Electronics Engineers, Inc. (IEEE)

IEEE Std 1100-1992 IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment

ANSI/IEEE Std. 802.3 Local and Metropolitan Area Networks; Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications

National Fire Protection Association (NFPA)

NFPA 70 National Electric Code ®

2.3 Obtaining Documents

a. Copies of the FAA documents and other applicable FAA specifications, standards, directives, advisory circulars, NAS documents, and drawings may be obtained from the Contracting Officer in the FAA Office issuing the Screening Information Request (SIR). Requests should fully identify materials desired; i.e., specifications, standards, amendments and drawing numbers and dates. Requests should cite the SIR or the contract involved or other use to be made of the requested material.

b. Copies of military standards and specifications may be obtained by mail or by telephone from the Department of Defense, Automated Printing Service, Bldg. 4, Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. For Telephone requests, call (215) 697-2179/4107, 7:30 AM to 4:00 PM, Monday through Friday. Information is also available at their website, **http://www.astimage.daps.dla.mil/online.** A charge is made for each document ordered.

c. Federal Standards documents may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

d. Copies of ANSI/ASQC-Q-9001-1994 and ISO 9000-3 can be obtained from the following source: American Society for Quality Control, 611 East Wisconsin Avenue, P.O. Box 3005, Milwaukee, Wisconsin 53201-3005; Phones: (414) 272-8575, (800) 248-1946, FAX: (414) 272-1734.

e. EIA documents may be obtained from Engineering Department, The Electronic Industries Association, 2001 Pennsylvania Avenue, NW, Washington, DC 20006.

f. IEEE documents may be ordered from IEEE, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331. For Telephone Requests, call (800) 678-IEEE. Documents may also be ordered via the IEEE website, **http://www.ieee.org/prod_svcs.html.**

g. Copies of the Acquisition Management System Test and Evaluation Process Guidelines are available in the FAA Acquisition System Toolset (FAST). The on-line internet address of FAST is: **http://fast.faa.gov.**

3 REQUIREMENTS

3.1 System Definition

The MIAWS system shall include a processor, communications equipment, hardware racks; archive recorders, and Situation Display (SD) terminals,. Figures 3-1 and 3-2 depict the MIAWS Network Architecture used by the MIT/LL MIAWS Prototype systems at Memphis and Jackson, respectively. Although Figures 3-1, 3-2, 3-11 and 3-13 indicate the presence of an APUP Simulator, the APUP Simulator will not be part of the MIAWS system to be designed and provided by the flyoff contractors.

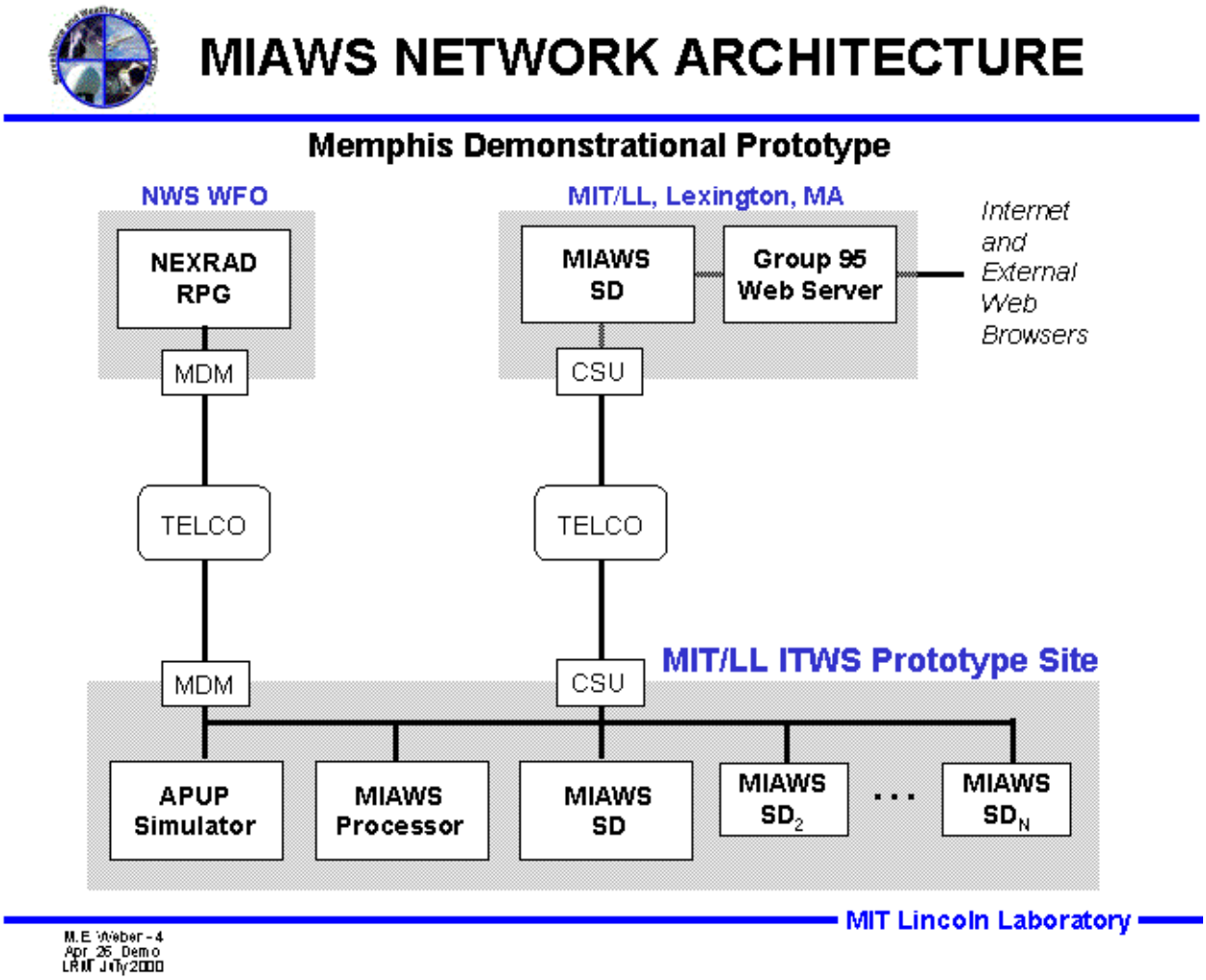

Figure 3-1: Memphis MIAWS Prototype Network Architecture

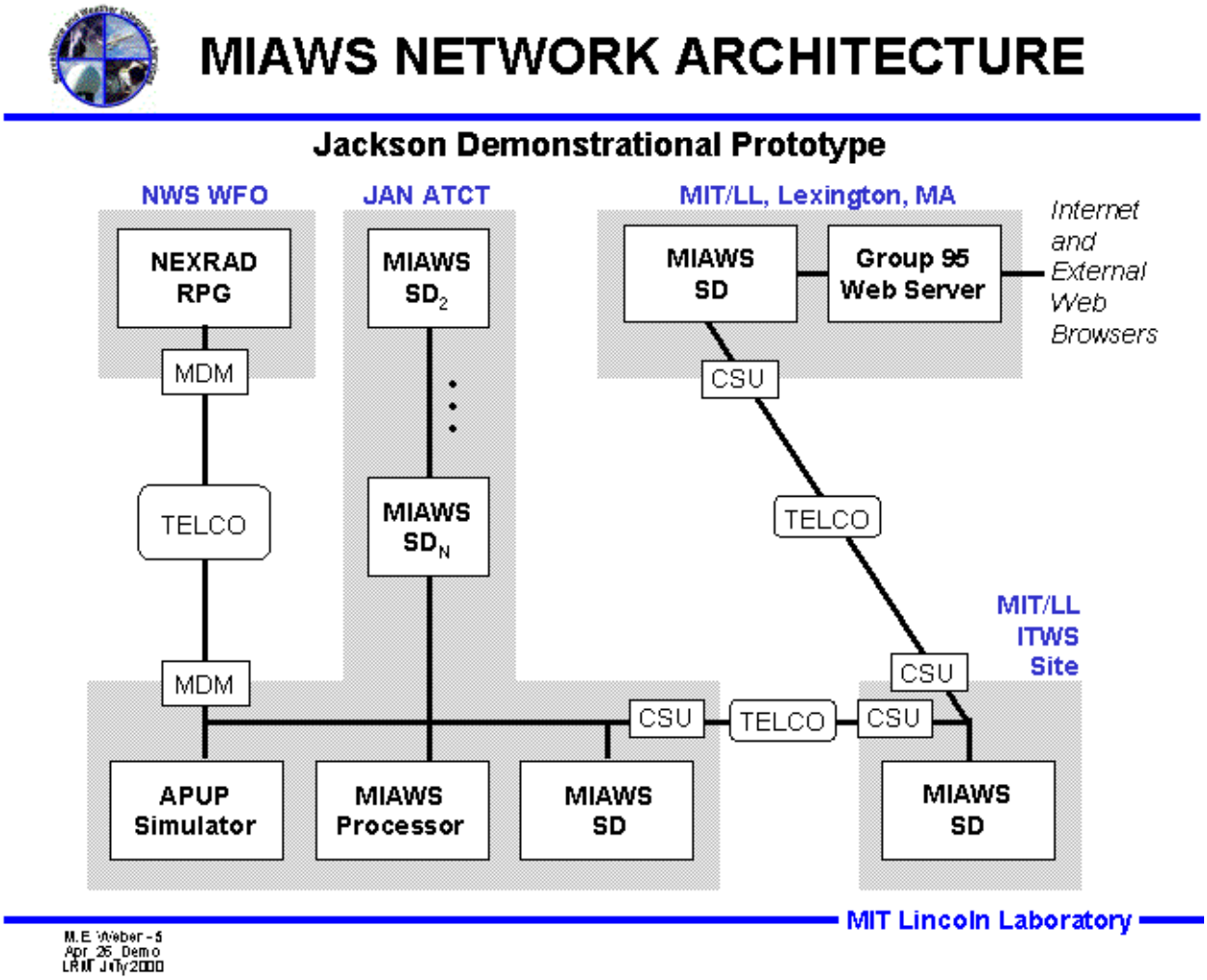

Figure 3-2: Jackson MIAWS Prototype Network Architecture

3.1.1 Mission

3.1.1.1 Safety Mission

MIAWS will enhance the safety of air travel by providing timely and accurate weather information in the terminal area of medium-intensity airports.

3.1.1.2 Capacity Mission

MIAWS will improve the management of air traffic in the terminal area through the detection and tracing of precipitation and the censoring of false weather echoes caused by Anomalous Propagation (AP).

3.1.2 MIAWS System Performance

The following are operational performance requirements for the MIAWS. The subsections below

reference "GFP algorithms from the MIT/LL MIAWS prototype." These algorithms, supplied as part of the GFI software, are GFP, and shall be used in the fly-off and production versions of MIAWS, and shall not be modified by the Contractor, except as specifically indicated in this Specification. When modifications in the GFP algorithms are specifically mandated by this specification, capabilities in the MIT/LL MIAWS Prototype GFP algorithms that are not to be implemented in the flyoff version of MIAWS shall be disabled, but not removed, from the algorithms delivered as part of the flyoff version of the MIAWS software. Such modifications shall be identified to the Government during Design Reviews.

3.1.2.1 Precipitation Reflectivity Product

A precipitation reflectivity product shall be implemented and distributed to the SD, as per the GFP algorithms used in the MIT/LL MIAWS Prototype. To do so, MIAWS shall receive and process weather data from NEXRAD. The precipitation reflectivity product shall be displayed in the six VIP levels used by the National Weather Service, as per Advisory Circular AC-00-45, Section 7, Aviation Weather Services. The levels shall be as follows:

(a) Level 0 < 18 dBZ

(b) Level 1 ≥ 18 and < 30 dBZ

(c) Level 2 ≥ 30 and < 41 dBZ

(d) Level 3 ≥ 41 and < 46 dBZ

(e) Level 4 ≥ 46 and < 50 dBZ

(f) Level 5 ≥ 50 and < 57 dBZ

(g) Level 6 ≥ 57 dBZ

The SD weather display shall permit the use of any of the color combinations in Table 3-1.

Table 3-1

	RGB Color Model Numbers (0-255)		
SD Color Description	Red	Green	Blue
Level 0	161	161	161
Level 1	160	240	0
Level 2	96	176	0
Level 3	240	240	0
Level 4	240	192	0
Level 5	224	144	0
Level 6	160	0	0

No coverage	75	75	75

An example of the precipitation product's implementation on the MIT/LL MIAWS Prototype is shown in Figure 3-3. The capability to display different color patterns for current and advected preipitation products, shown in Figure 3-3, has not been implemented in the GFP Display algorithms in the MIT/LL MIAWS Prototype. This capability shall not be implemented in the version of MIAWS developed by the flyoff contractors.

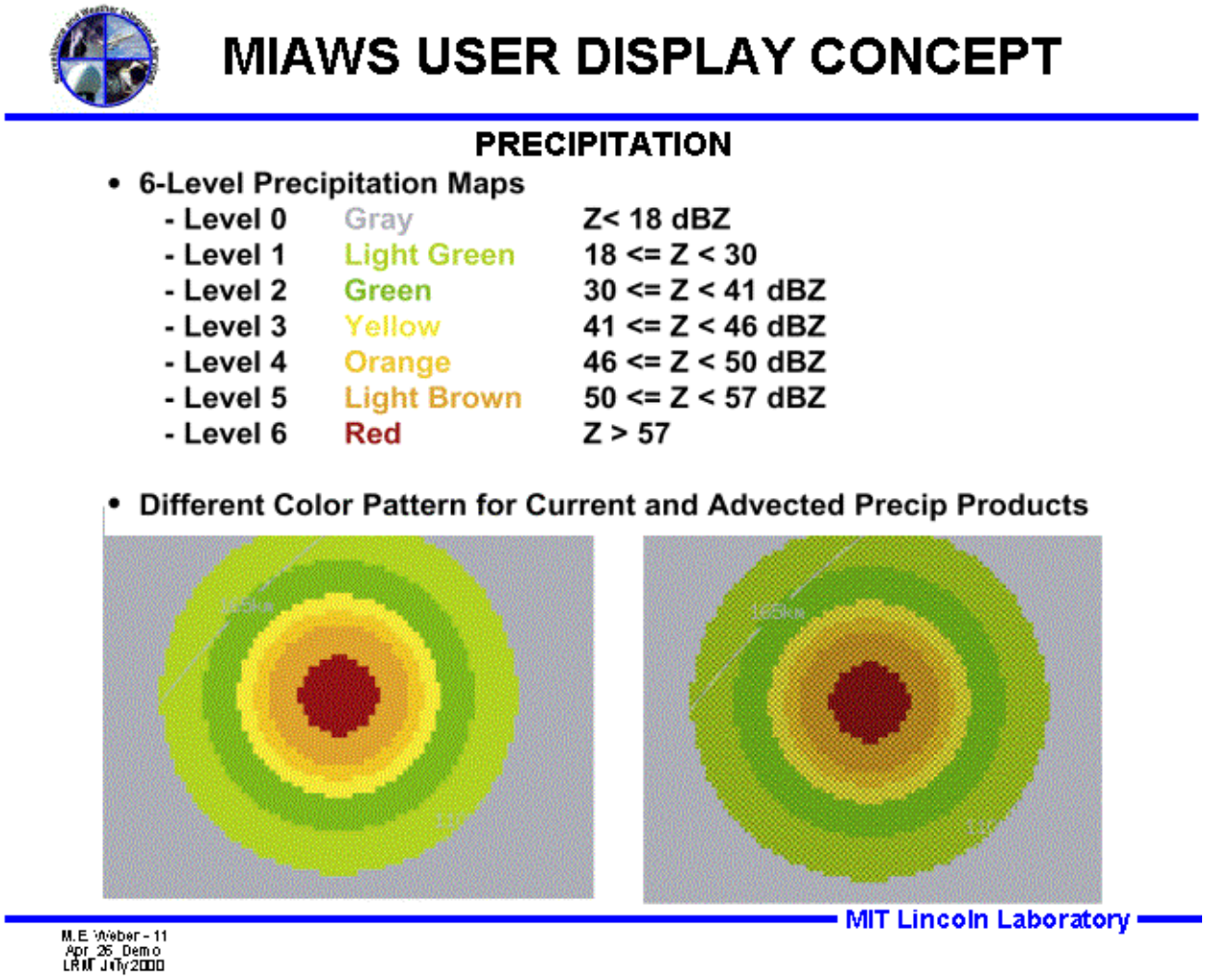

Figure 3-3: MIAWS Precipitation Reflectivity Product

[Note: The correct limits for Level 6 are "greater than or equal to 57 dBZ", as stated in the Section 3.1.2.1's text. The figure will be corrected in a future version of the specification.]

3.1.2.1.1 Coverage Range

MIAWS shall provide precipitation information for display on the SD using the same format as employed in the MIT/LL MIAWS prototype. MIAWS shall display the location, extent, and intensity of precipitation. Coverage for this product shall be for 360-degrees in azimuth centered on the Airport

Reference Point (ARP) out to the full range and altitude of the available radars or out to a 100 nautical mile range and 70,000 ft. altitude, whichever provides the broadest possible coverage (will vary from site to site). The MIAWS software shall accommodate the capability described in the preceding sentence.

[Note: The FAA is considering requirements to mosaic radar coverage from multiple NEXRADs near to an airport to improve coverage. These requirements and their implementation on the MIT/LL MIAWS Prototype are not yet fully mature. Specific requirements for mosaics will be developed for the production version of MIAWS, after the flyoff.]

3.1.2.1.2 Accuracy and Display Resolution

The display resolution of the precipitation reflectivity information shall be 1km.

3.1.2.1.3 AP Edit Performance

MIAWS shall perform AP editing using the latest revisions of the NWS-approved AP mitigated product (NEXRAD product #67) and the GFP AP edit algorithm from the MIT/LL MIAWS prototype.

3.1.2.1.4 Product Update Rate

The product update rate for the precipitation maps shall be 5 – 10 minutes based on the NEXRAD scan strategy.

NEXRAD employs four volume coverage patterns (VCPs): VCP11, VCP21, VCP31, and VCP32, each with a unique scan strategy:

- VCP11 is used to scan precipitation and severe weather and results in a five-minute precipitation product update rate.
- VCP 21 is an alternative scan strategy for precipitation and severe weather (used to reduce the NEXRAD processing load) and results in a six-minute precipitation product update rate.
- VCP31 is used to scan in clear air and utilizes a long radar pulse; it results in a ten-minute precipitation product update rate.
- VCP32 is used to scan in clear air and utilizes a short radar pulse; it results in a ten-minute precipitation product update rate.

Using the GFP algorithms from the MIT/LL MIAWS prototype, the MIAWS shall accommodate:

?? Each VCP's precipitation product update rate as provided by NEXRAD

?? The selection among the VCPs as performed by NEXRAD

For more information on the NEXRAD scan strategies and VCPs, see Chapter 5 of FCM-H11C-1991, Federal Meteorological Handbook No. 11, Doppler Radar Meteorological Observations, Part C, WSR-88D (NEXRAD) Products and Algorithms.

3.1.2.1.5 Display Update Rate

The display update rate for precipitation product shall be 30 seconds, as per the GFP algorithms in the MIT/LL MIAWS prototype.

3.1.2.1.6 Product Advection

The precipitation product shall be advected to provide a 30 second display update rate, as per the GFP algorithms in the MIT/LL MIAWS prototype. An advected precipitation reflectivity product shall be displayed in a different color pattern than the corresponding non-advected product, as per the GFP algorithms in the MIT/LL MIAWS Prototype and as illustrated in Figure 3-3. The rationale for product advection is indicated in Figure 3-4, which shows the differences in update rates between NEXRAD and MIAWS.

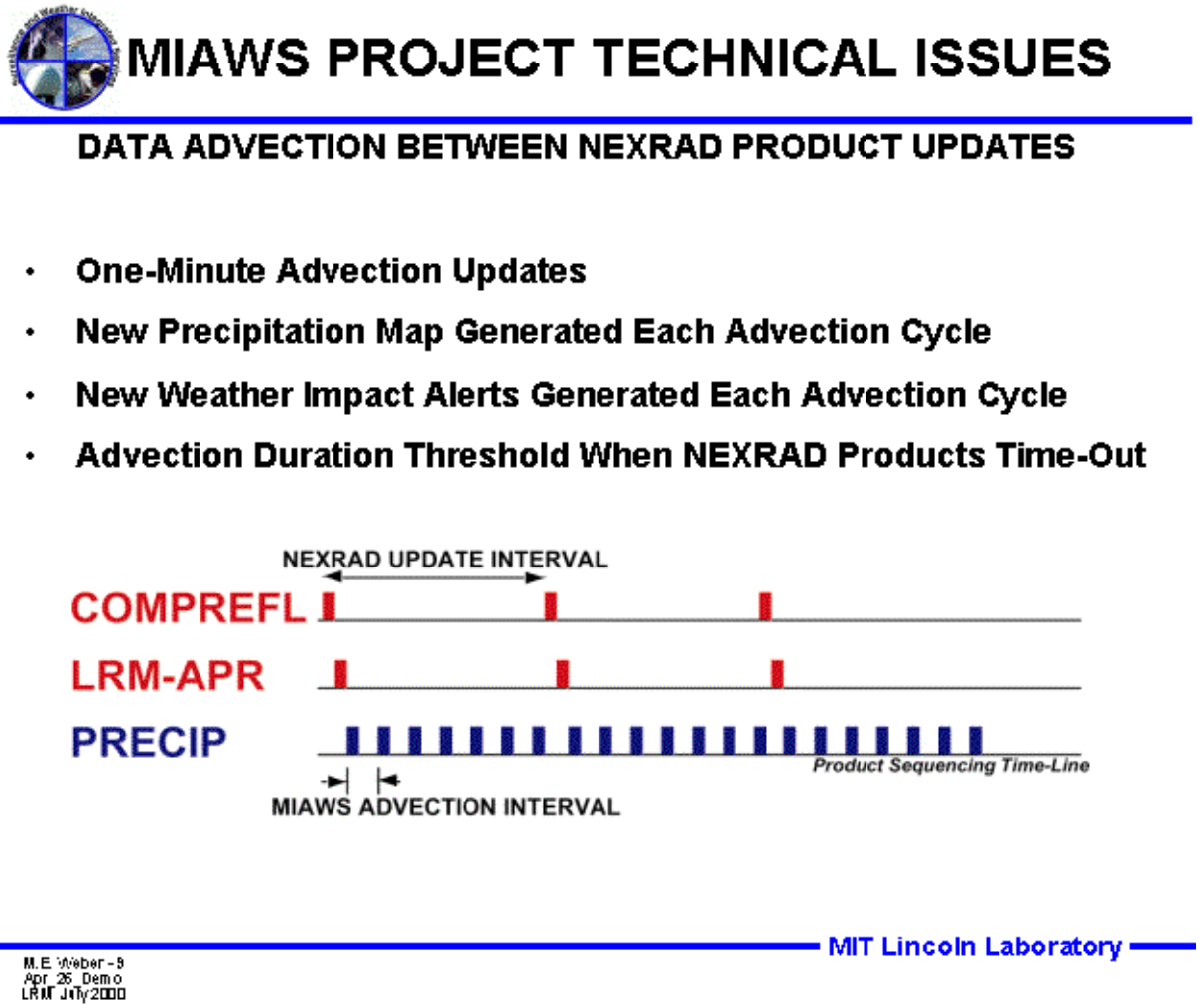

Figure 3-4: Rationale for Advection – Differences in Update Rates between NEXRAD and MIAWS

[Note: Even though Figure 3-4 indicates a one-minute advection update, the 30 second update rate called out in the text of the specification is correct. The figure will be corrected in a future version of the specification.]

3.1.2.2 Storm Detection and Extrapolated Position Product

MIAWS shall track storm motion. The storm cell speed, the movement direction, and the storm cell positions (current and future) for VIP level 3 or greater, shall be displayed on the SD. Speed and direction of storm motion shall be generated and displayed, as per the GFP algorithms in the MIT/LL MIAWS prototype. Current storm leading edge positions and two forecasted positions, ten and twenty minutes into the future, shall be displayed on the SD, as per the GFP algorithms in the MIT/LL MIAWS prototype.

3.1.2.2.1 Storm Detection and Extrapolated Position Product Details

The Storm Motion and Extrapolated Position product (computed using the corresponding precipitation product) shall be displayed on the SD. There shall be two components to the display of the Storm Motion and Extrapolated Position product: storm motion arrows and numbers and storm extrapolated position lines. The storm motion arrows and numbers are referred to as SMs. The extrapolated position lines are referred to as SEPs. SMs are associated with storm cells within a storm; SEPs are associated with storms.

The Storm Motion indicator shall be a black arrow (direction) and a black number (speed) associated with each storm cell with size, shape, and numerical value as computed by the GFP algorithms of the MIT/LL MIAWS prototype:

- The base of each arrow shall be placed at the location designated by the algorithm.
- The corresponding black number shall be placed near the base of the arrow.
- The arrow shall not obscure the number.
- The arrow shall point in the direction of motion as computed by the GFP algorithms in the MIT/LL MIAWS prototype.

The leading edge of the storm shall be indicated with a solid cyan line, with size and shape as computed by the GFP algorithms of the MIT/LL MIAWS prototype. The extrapolated positions of the leading edge (i.e., SEPs forecast 10 and 20 minutes into the future as computed by the GFP algorithms of the MIT/LL MIAWS prototype) shall be indicated with dashed cyan lines, with size and shape as computed by the GFP algorithms of the MIT/LL MIAWS prototype.

Figure 3-5 shows a typical representation of the SMs and SEPs.

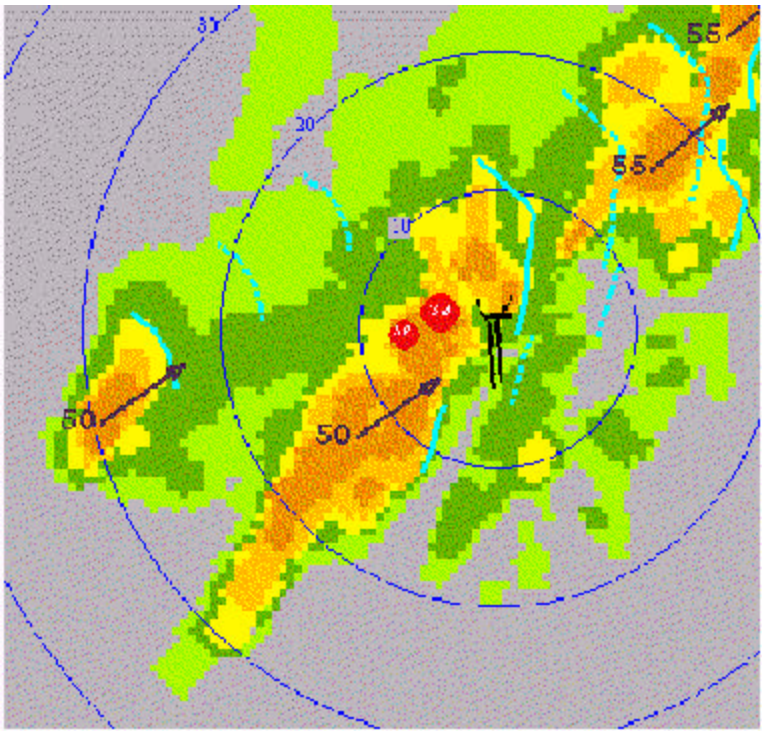

Figure 3-5. Storm Motion and Extrapolated Position Product

3.1.2.2.2 Storm Motion Coverage

The MIAWS shall provide a storm motion coverage area for 360-degrees in azimuth centered on the existing airport radar out to the full range and altitude of the available radars or out to a 100 nautical mile range and 70,000 ft. altitude, whichever provides the broadest possible coverage (will vary from site to site).

3.1.2.2.3 Accuracy

The MIAWS shall provide the following storm motion accuracy:

(a) Speed and Direction Estimates

[TBD]

(b) Storm Extrapolated Positions

[TBD]

[Note: The FAA is considering a percentage correctness measure.]

3.1.2.2.4 Product Update Rate.

The MIAWS shall provide a 5-10 minute data update rate, based on the NEXRAD scan strategy described in Section 3.1.2.1.4, for the associated NEXRAD precipitation product that is the basis for the MIAWS Storm Motion and Extrapolated Position Product.

3.1.2.2.5 Display Update Rate

The MIAWS shall provide a 30 second display update rate for the MIAWS Storm Motion and Extrapolated Position Product, as per the GFP algorithms in the MIT/LL prototype.

3.1.2.2.6 Product Advection

The MIAWS shall advect the storm motion product to provide a 30 second display update rate, as per the GFP algorithms in the MIT/LL prototype. The rationale for product advection is indicated in Figure 3-4, which shows the differences in update rates between NEXRAD and MIAWS.

3.1.2.3 MIAWS SD

Sections 3.1.2.4-3.1.2.7, 3.1.2.11, and 30.2 (including subsections) reference display components of the MIAWS SD. For reference, and to aid understanding of the placement of these display components on the SD, Figure 3-6 shows the full SD and many of the display components.

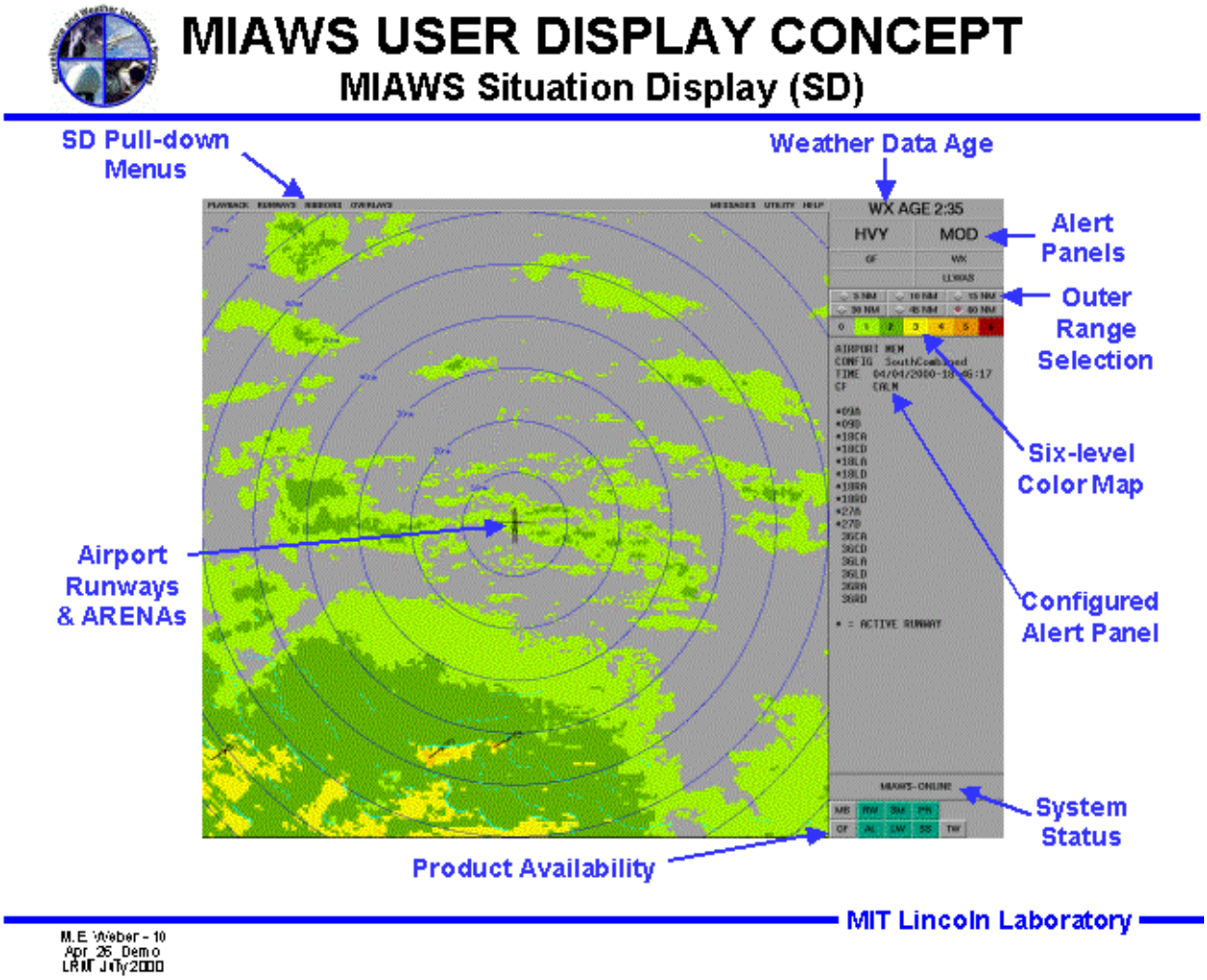

Figure 3-6: MIAWS Situation Display (SD)

3.1.2.4 Alert Products

The Alert Products that shall be displayed on the SD include:

a. Alert Panel Display

The SD shall have panels or buttons to indicate weather alerts at the airports. These shall include the indication of heavy precipitation (HVY), the indication of moderate precipitation (MOD), the indication of Level 3 or greater weather within 20 minutes of the airport or at the airport (WX), and the indication that the LLWAS is alarming (LLWAS). The alert panel display shall be configured as in the MIT/LL MIAWS Prototype and shall be updated according to the GFP algorithms in the MIT/LL MIAWS Prototype. Figure 3-7 provides a pictorial view of the Alert Panel Display and an explanation of its functions. The GFP algorithms in the MIT/LL MIAWS Prototype contain a priority scheme for mediating among MIAWS and LLWAS alerts, which shall be left intact in the MIAWS design developed by the flyoff contractors. The GFP algorithms in the MIT/LL MIAWS Prototype contain a capability to interface with MIAWS with Ribbon Display Terminals (RDTs). The capability to interface MIAWS-generated alert data to RDTs shall not be implemented by the flyoff contractors. The capability to interface MIAWS with the RDTs shall be disabled in the GFP algorithms and shall be retained within the computer code developed by the flyoff contractors, in an inoperative status. Such modifications shall be identified to the Government during Design Reviews.

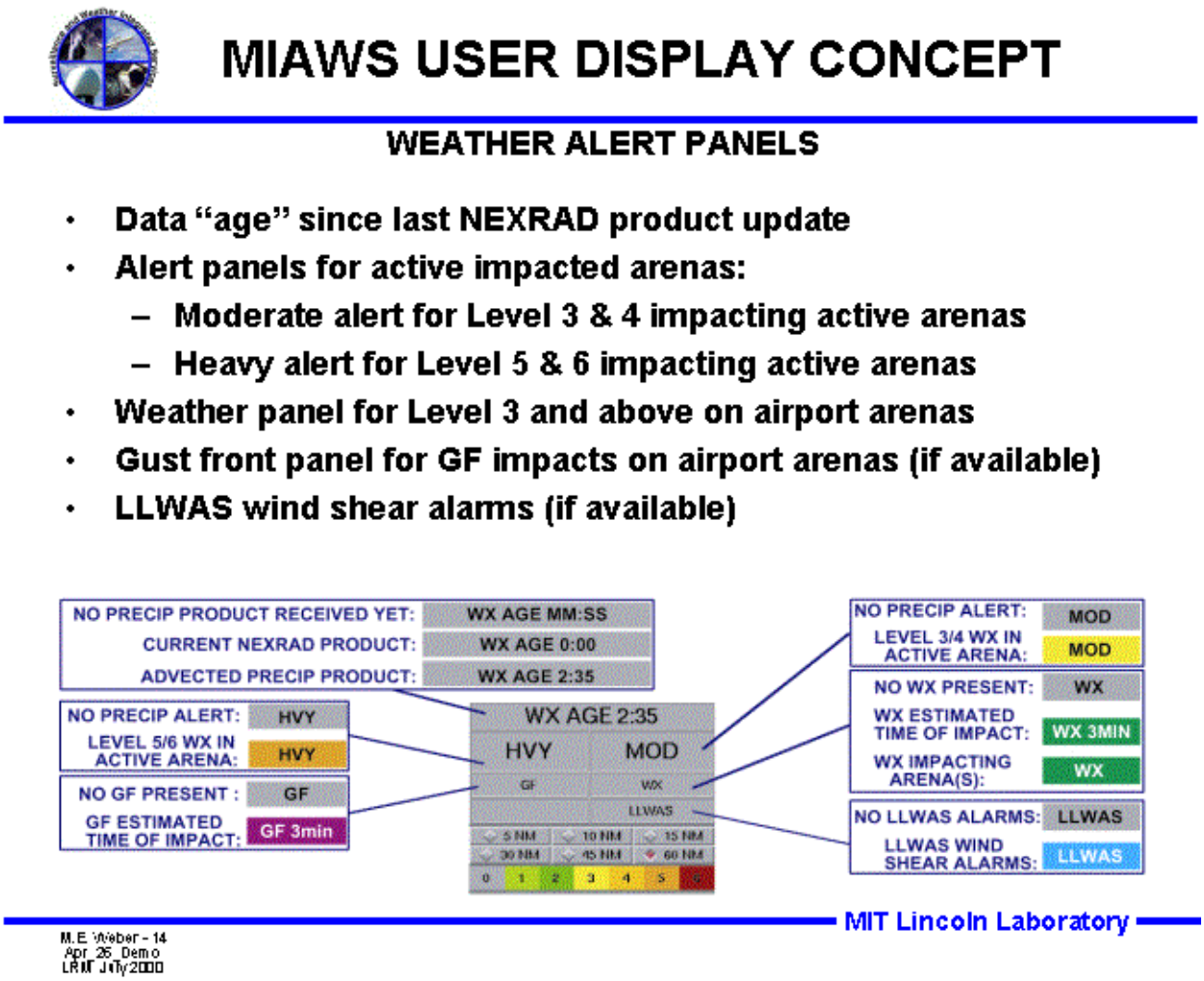

Figure 3-7: Alert Panel Display

b. Alert Messages

The SD shall display alert messages that provide runway identification, precipitation severity, and location of first encounter with significant precipitation. The alert messages shall be configured as in the MIT/LL MIAWS Prototype. Figure 3-8 provides a pictorial view of the Alert Messages and an explanation of them.

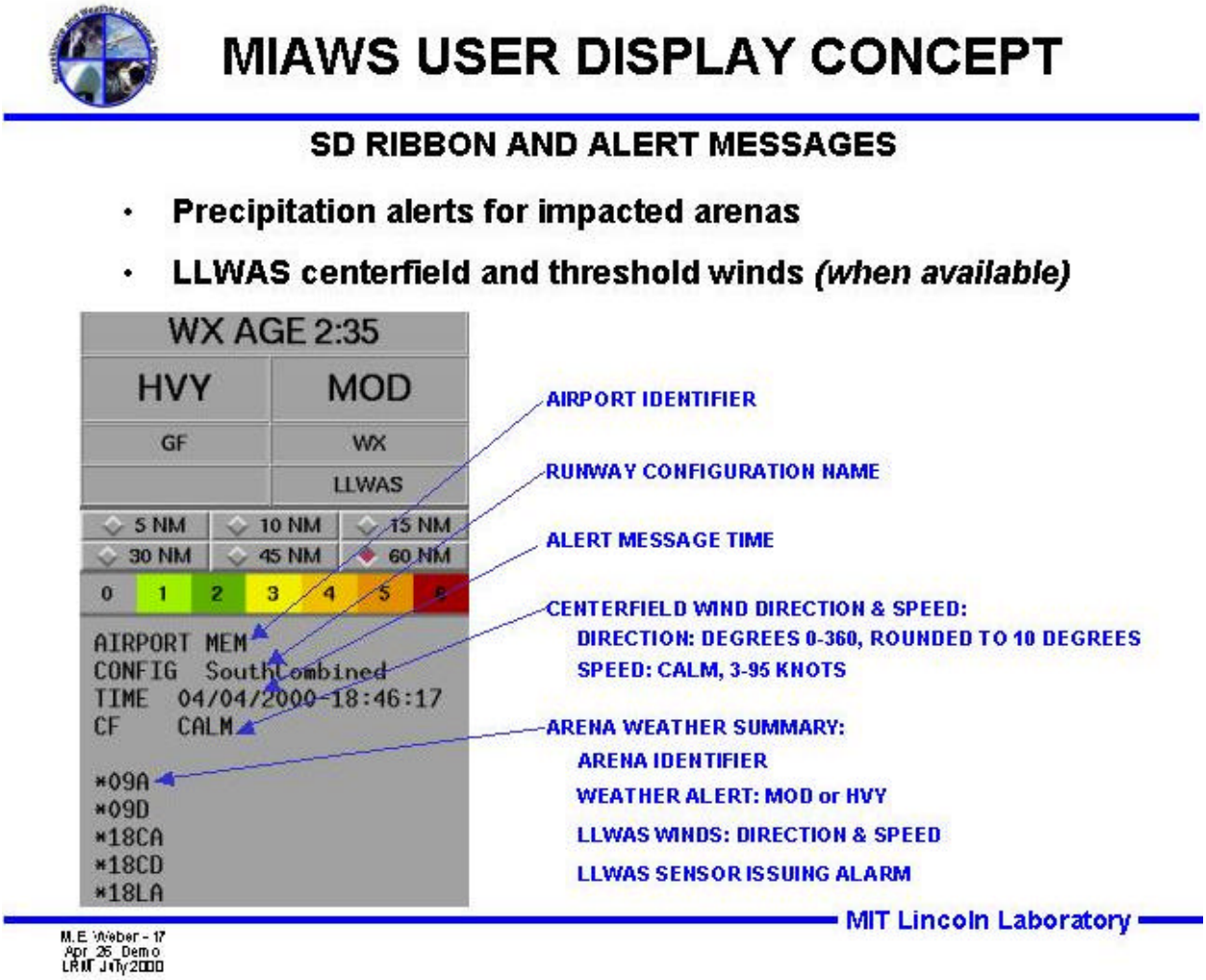

Figure 3-8: SD Alert Messages

c. Colored Runways

The SD shall indicate the runways impacted with weather by displaying the impacted runway(s) in red, and shall be configured as in the MIT/LL MIAWS Prototype. The SD shall show the Active Runway Outlined in Red for Precipitation Reflectivity Levels 3 and 4 impacts and shall show the Active Runway Filled in Red for Precipitation Reflectivity Levels 5 and 6, as indicated in Figure 3-9.

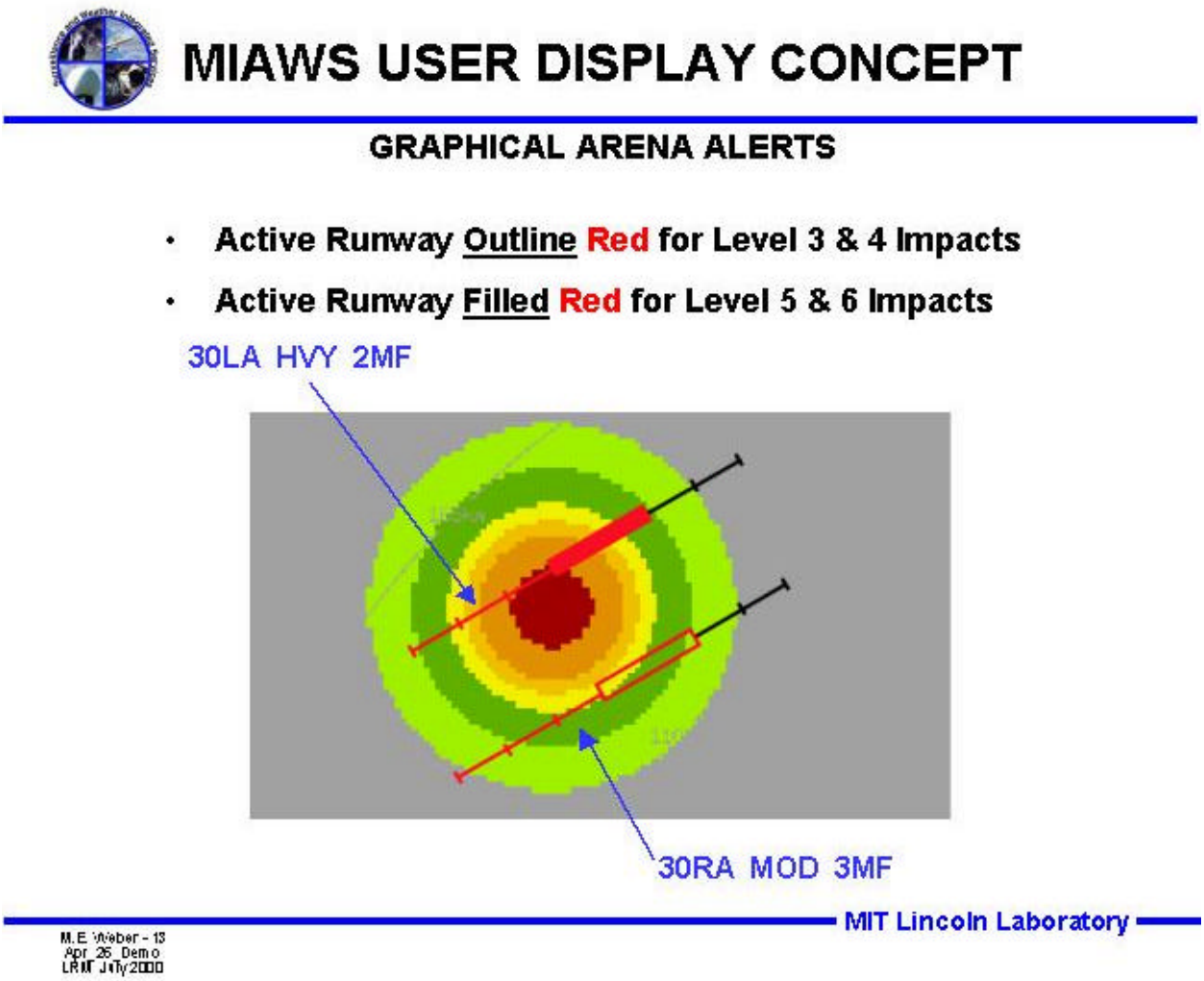

Figure 3-9: Active Runway Indications for Precipitation Level Impacts

d. Configured Alerts Panel

The SD shall display the following information in the Configured Alerts Panel area of the SD:

(1). The airport name, configuration name, and time/date (GMT)

(2). Representative airport wind speed, direction and gust, if available.

(3). Sensor/runway wind speed and direction, upon the availability of LLWAS-RS.

(4). Wind shear alerts, upon the availability of LLWAS-RS.

The Configured Alerts Panel area of the SD shall be configured as in the MIT/LL MIAWS Prototype. Also see Section 30.2.2.1 and Figure 30-2.

3.1.2.5 Runway Configuration Product

The SD shall display a Runway Configuration Product Display window, to indicate the current configuration. The Runway Configuration Product Display window of the SD shall be configured as in

the MIT/LL MIAWS Prototype. Also see Section 30.2.2.3 and Figure 30-4.

3.1.2.6 Product Availability Window

The SD shall display product availability for each MIAWS product on a product availability window that shall be configured and operate as in the MIT/LL MIAWS Prototype. Associated processing with respect to determination and display of product availability shall be IAW the functionality in the MIT/LL MIAWS Prototype. The Product Availability Window and the color codes for the product "buttons" are shown on the left-hand side of Figure 3-10. The color codes indicated in the figure shall be used.

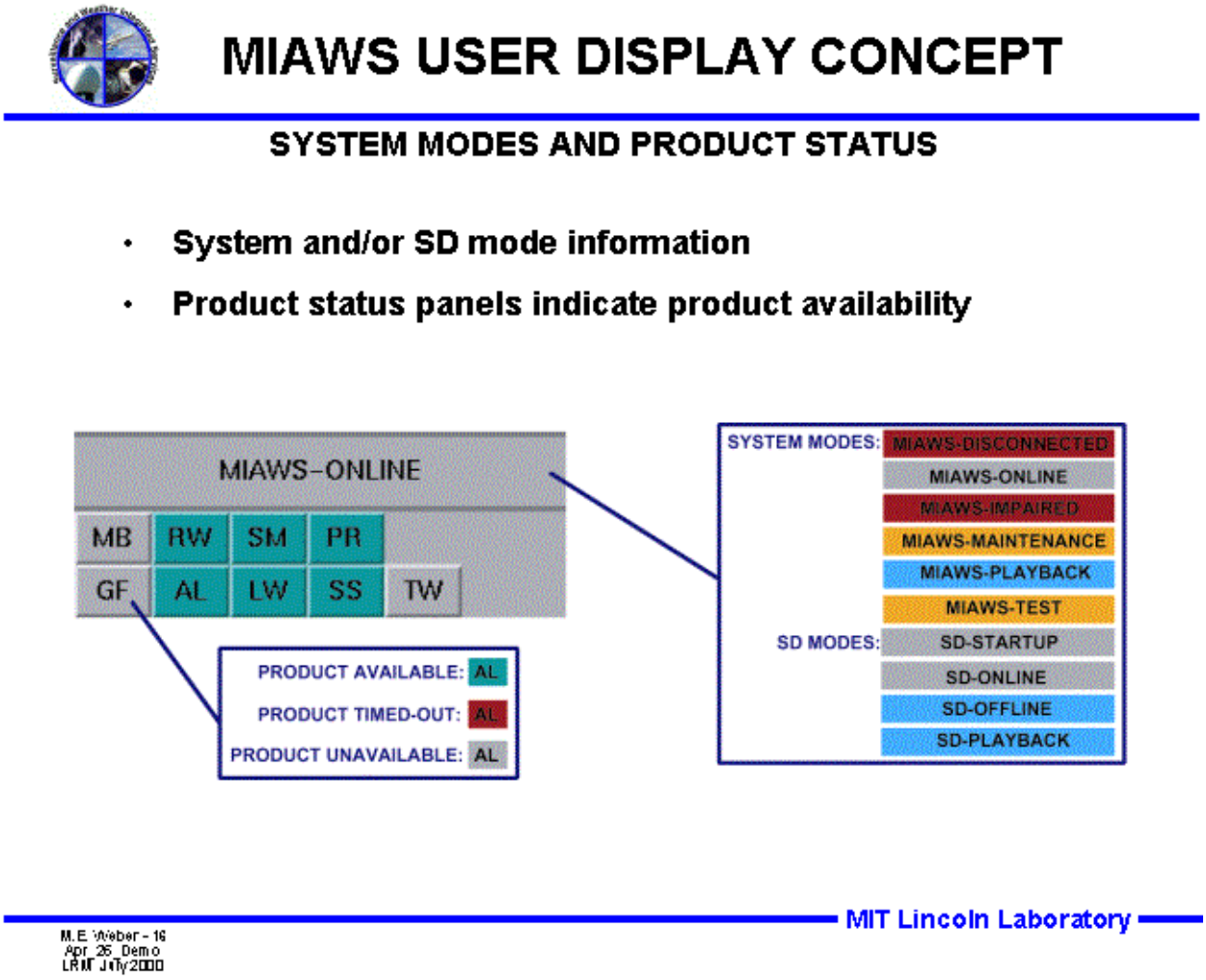

Figure 3-10: System Modes and Product Status

[Note that the Modes indicated on the right-hand side of Figure 3-10 do not match the present capability of the MIT/LL MIAWS Prototype. The present capability is reflected in the GFP display algorithms from the MIT/LL Prototype and agrees with the requirements in Section 3.1.3.1 and associated subsections. Figure 3-10 will be corrected in a future release of this specification.]

3.1.2.7 System Status Window

The SD shall display a system status window, implementing the functionality in the MIT/LL MIAWS prototype, to indicate the current status of subsystems, including:

a. The MIAWS product generator

b. Available NEXRADs

c. Available ASR-11s

d. Available LLWASs

e. The MIAWS network (indicating that all nodes of the network are responsive/not responsive)

3.1.2.8 Character Graphics and Weather Text Message Product

MIAWS shall provide a character graphics and weather text message product for display on the SD, implementing the functionality in the MIT/LL MIAWS prototype, as per the GFP algorithms in the MIT/LL prototype. This product shall be available to an external port of the MIAWS processor. For reference, general requirements that apply to this product are in Chapter 18 (for weather text) and Chapter 19 (for character graphics) of Report No. DOT/FAA/ND-95/11, Rev. D, Terminal Weather Information for Pilots (TWIP), May 15, 1998.

3.1.2.9 Reserved

3.1.2.10 Product Distribution

All MIAWS products shall be distributed to displays with latency of 5 seconds or less from the time of their generation. Latency shall be measured using a tool supplied as GFP, which is present in the software to provide the measurements.

3.1.2.11 User Input

a. Display Range

The SD shall allow users to select the maximum range of the display with selectable ranges of 5 nm, 10 nm, 15 nm, 30 nm, 45 nm, 60 nm, and 100 nm.

[Note: Elsewhere in Sections 3 and 30, some figures show sets of display ranges other than those listed in Section 3.1.2.11a. The text of Section 3.1.2.11a has the correct display range set, and the figures will be corrected in a future version of the specification.]

b. Precipitation Level

The SD shall allow users to select from 1 to 6 levels of displayed precipitation. When other than Level 6 is selected, the display shall include all higher levels; selecting Level 6 shall display only Level 6. For example, if Level 3 is selected, then Levels 3, 4, 5, and 6 are displayed. Also see requirements in Section 3.1.2.1.

c. Runway Configuration

The SD shall allow users to change the runway configurations without disrupting the system, IAW with the functionality of the GFP algorithms in the MIT/LL MIAWS prototype. Also see Section 30.2.3.2 and Figure 30-7, Section 30.2.4.6 and Figure 30-28, and Section 30.2.4.4 and Figure 30-26.

d. Overlays

The SD shall allow users to change overlays, IAW with the functionality of the GFP algorithms in the MIT/LL MIAWS prototype. Also see Section 30.2.3.4 and Figure 30-9.

e. Background Color

The SD shall offer users a selectable list of gray-scale colors for SD background, to adapt to ambient lighting conditions, IAW with the functionality of the GFP algorithms in the MIT/LL MIAWS prototype. Also see Section 30.2.3.17 and Figure 30-22.

3.1.2.12 Update Commands

Within 5 seconds after the operator has changed an active runway or a non-associated runway arena, MIAWS graphic and alphanumeric products affected by these changes shall be updated to reflect the changes. Measurement of the 5 seconds shall begin with the entry of the command(s) implementing runway and/or non-associated runway arena changes, and shall conclude with the updated display of the affected MIAWS products.

3.1.2.13 Service Level

MIAWS shall be designed and implemented so it can be maintained as an essential system, as defined by Section 3.8.1, NAS-SR-1000, NAS Systems Requirement Specification.

3.1.2.14 Operational Availability

The MIAWS shall have an operational service availability of 0.99967.

3.1.2.15 Reliability

The MIAWS Mean Time Between Critical Failures (MTBCF) shall be 2190 hours.

3.1.2.16 Mean Time To Restore

The MIAWS shall have a Mean Time to Restore (MTTR) of 0.5 hour.

3.1.2.17 On-Site Maintenance

MIAWS shall be designed, built, and implemented so that it meets the maintenance requirements of FAA Order 6000.30 and the on-site maintenance requirements of FAA Order 6000.15. MIAWS shall be designed, built and implemented so that on-site maintenance visits, for preventative and corrective maintenance, shall occur no more than four times per year on average, for each type of maintenance (preventative and corrective). MIAWS shall be designed, built, and implemented so that total time to accomplish preventative maintenance tasks shall not exceed twelve staff hours per year. MIAWS shall be designed, built, and implemented so that no preventative maintenance task requires more than one person to accomplish.

3.1.3 System/SD Modes

3.1.3.1 System/SD Modes Enumerated

The System shall have Four Modes: Operational, Maintenance, Test Mode, and SD Playback The system is in Operational Mode unless it is placed into one of the other modes manually. There is no automatic switchover from the Operational Mode to any of the other modes. These system/SD modes shall be displayed on the SD as per the MIT/LL MIAWS Prototype and its GFP algorithms. ***[Please also see note below Figure 10.]***

3.1.3.1.1 Operational Mode

The MIAWS Operational mode shall be manually selected and manually deselected.

3.1.3.1.2 Maintenance Mode

The Maintenance mode is used to support maintenance activities of the MIAWS. The Maintenance mode shall be manually selected and manually deselected. The MIAWS shall enter the Maintenance mode when manually commanded at an appropriately configured SD. The MIAWS shall leave the Maintenance mode (enter the Operational mode) when manually commanded at an appropriately configured SD. When in Maintenance Mode, the SD shall display an image indicating that it is in Maintenance Mode.

3.1.3.1.3 Test Mode

The Test Mode is used by maintenance personnel to test changes made to the system. The Test mode shall be manually selected and deselected. The MIAWS shall enter the Test Mode when manually commanded at an appropriately configured SD. The MIAWS shall leave the Test Mode when manually commanded at an appropriately configured SD.

3.1.3.1.4 SD Playback

The SD Playback mode is used to playback archived product data on an SD. The SD playback mode shall be manually selected and deselected. An individual SD shall enter the SD playback mode when manually commanded from that SD. An individual SD shall leave the SD playback mode when manually commanded from that SD. For more requirements on playback of archived product data, see Section 3.1.4.5.2.

3.1.3.1.5 Mode Changes

All mode changes shall be manually initiated.

3.1.3.2 Red 'X'

A red 'X' shall be displayed on a SD in the same format as is used in the MIT/LL MIAWS prototype, under the following conditions:

?? If the precipitation product is unavailable.

?? If the SD GUI has not been updated by the SD software process with a threshold period (nominally 75 seconds).

?? If there are no System Status Updates within a threshold period (nominally 40 seconds)

?? During the Startup period, immediately after MIAWS is powered up, before any products are ready to be displayed.

The MIT/LL MIAWS Prototype GFP display algorithms cause the Red 'X' to be displayed under the following additional conditions:

?? Timeout of the following products:
Alerts – 30 seconds
Runway Configuration Updates – 150 seconds

?? Built-in system diagnostics report an impairment:
- Either the NEXRAD RDA or RPG is not on-line
- Any of the "high priority" network nodes are not responding

The additional conditions listed immediately above shall be not be implemented in the flyoff version of the MIAWS software. These capabilities in the MIT/LL MIAWS Prototype GFP algorithms that are not to be implemented in the flyoff version of MIAWS shall be disabled, but not removed, from the algorithms delivered as part of the flyoff version of the MIAWS software.

3.1.4 System Functions

The MIAWS is comprised of four functional areas:

(a) Data Acquisition. The DA function shall acquire NEXRAD product messages, and LLWAS wind data. The DA function shall format this data for use by the DP, as per the GFP algorithms in the MIT/LL MIAWS prototype.

(b) Data Processing. The DP function shall perform product generation and data archiving using GFP software functionality. The products to be generated shall be those listed in Section 1.3.4. The products to be archived shall be those listed in Section 1.3.4.

(c) Display Function. The DF is hosted in COTS processors, called SDs, at the ATCT and TRACON, and employs the following functions in the same fashion as in the MIT/LL MIAWS Prototype, using the same formats as the prototype for output products, input formats, and runway

maps. Detailed requirements and formats are provided elsewhere in this Specification. The DF shall perform graphic display of these output products: airport maps, airport specific runways, weather images, and wind data. The DF shall accept runway designations from air traffic controller supervisors and display them. As per the GFP display algorithms of the MIT/LL Prototype, runway designation changes shall be capable of being made while the system is operating and these changes shall be reflected on displays after they have been made by air traffic control supervisors. The DF shall provide runway-specific weather product alarms and alerts to air traffic controllers. Runway maps shall be stored in the SD at the time of installation and shall be capable of being modified as required subsequently. The DF shall display LLWAS wind information within five seconds of receipt across the MIAWS/LLWAS interface.

(d) SC/DF Function. MIAWS will contain a capability for system status monitoring, reporting, and error diagnosis. The SC/DF, through the MDT, is also the entry port for entering system control commands and site adaptable data.

3.1.4.1 Data Acquisition

The MIAWS Data Acquisition function shall execute the functionality in the MIT/LL MIAWS Prototype Software Architecture. This functionality is included in the GFI software. The DA incorporates the functionality performed by the NEXRAD Product Server and LLWAS Server in the software of the MIT/LL MIAWS prototype.

3.1.4.2 Data Processing

Software developed for MIAWS consisting of product generation and data archiving shall be developed using "open systems" computer hardware. The MIAWS DP shall execute the functionality in the MIT/LL MIAWS Prototype. This functionality is included in the Government Furnished Information (GFI) software.

3.1.4.2.1 MIAWS Processor

The MIAWS processor, which incorporates the DA and DP functions, shall be composed entirely of COTS processors. The MIAWS processor shall be capable of executing in real time the functionality of the GFI data processing software. The MIT/LL MIAWS Prototype includes a data processing computer that is consistent with the requirements of the MIAWS.

3.1.4.3 Display Function

The DF shall reside in the ATCT and the TRACON within the DFUs, and shall have the functionality described in the MIT/LL MIAWS Prototype Software Architecture. A DFU shall be composed of a SD and associated software. Each DFU shall include COTS computers capable of executing in real time, and software functionality developed/provided/acquired by the Contractor that is equivalent to that of the GFI DF software. Other requirements applicable to the DF are:

- The SD shall have an 900 Megahertz (MHz) or greater Central Processing Unit (CPU), 1 GByte or greater Random Access Memory (RAM) and a 10 GBytes or greater hard disk.
- The SD shall be protected against inadvertent or unauthorized modification of display adaptation parameters. These parameters shall include at least, the display center point, the background maps, and the runway configurations.

?? The DFU Ethernet port shall support transfer rates of 10 MHz or greater, depending on the industry standard, to accommodate higher bandwidth communication requirements within the MIAWS ATCT Local Area Network (LAN). The MIT/LL MIAWS Prototype includes a display processor that is consistent with the requirements of the MIAWS DF.

3.1.4.4 SC/DF Function

MIAWS shall contain a capability for system status monitoring, reporting, and error diagnosis, using the GFP algorithms in the MIT/LL MIAWS Prototype. The SC/DF, through the Maintenance Display Terminal (MDT), shall be the entry port for entering system control commands and site adaptable data.

3.1.4.4.1 MIAWS Site Adjustable Parameters

A candidate set of site adjustable parameters shall be developed that shall include at least those in the MIT/LL MIAWS Prototype. The candidate set will be subject to Government approval, and following approval, shall be implemented.

3.1.4.4.2 MIAWS Security

MIAWS equipment and design shall provide information security measures to protect its integrity and the integrity of the NAS, IAW with FAA Order 1370.82, DOT H 1350, and DOT H 1350.251. Control access to MIAWS shall be permitted only in response to a valid log-on procedure, based on a valid user ID in conjunction with a unique code word of at least eight alphanumeric characters. MIAWS equipment and design shall permit conformance with physical security IAW FAA Order 1600.69. The MIT/LL MIAWS Prototype GFP algorithms do not necessarily fully comply with the requirements in this paragraph. Modifications shall be made to the GFP algorithms as necessary to comply with these requirements. Such modifications shall be identified to the Government during Design Reviews.

3.1.4.4.3 Logging of System Operations

The MIAWS shall continuously generate and maintain a log of the latest 24 hours of the following system events:

a. User log-on, log-off, and unsuccessful log-on attempts;

b. System state and mode changes; and

c. Hardware, software, and communications errors detected.

The MIAWS shall display the system log upon request. The MIAWS shall provide the option of displaying the log as it is updated or in static form. The MIAWS shall write a copy of the system log to an appropriate printer port upon command from the MIAWS. The MIT/LL MIAWS Prototype GFP algorithms do not provide the capabilities to comply with the requirements in this paragraph. Modifications shall be made to the GFP algorithms as necessary to comply with these requirements. Such modifications shall be identified to the Government during Design Reviews.

3.1.4.5 Archiving Requirements

3.1.4.5.1 Product Archiving

The MIAWS shall continuously store, without user intervention, the last 15 days of generated weather products, the weather products that were displayed on each of the DFU SDs. On command from the MDT, the stored archive data shall be transferred to a removable physical storage medium. Archive data shall be tagged with synchronized time values. A suitable interface and physical storage media consistent with the present functionality of the GFI software shall be provided. Note that the MIT/LL MIAWS Prototype GFI software does not necessarily fully comply with all the requirements in this paragraph, particularly those related to archiving data on a removable physical storage medium. Modifications shall be made to the GFI software as necessary to comply with these requirements. Such modifications shall be identified to the Government during Design Reviews.

3.1.4.5.2 Playback of Archived Data

Playback of archived products shall support both an on-line storage device and a detachable physical storage medium. MIAWS shall be able to display the archived products on the SD in the same fashion as the MIT/LL MIAWS prototype, and employing the functionality of the software that runs on the MIT/LL MIAWS prototype. Playback of the and products shall be controllable from SD in the same fashion as the MIT/LL MIAWS prototype, employing the functionality of the software that runs on the MIT/LL MIAWS prototype. Note that the MIT/LL MIAWS Prototype GFI software does not necessarily fully comply with all the requirements in this paragraph, particularly those relating to supporting playback from a detachable physical storage medium. Modifications shall be made to the GFI software as necessary to comply with these requirements. Such modifications shall be identified to the Government during Design Reviews.

3.1.4.6 MIT/LL MIAWS Prototype Software Architecture and Major Software Processing Units/Functionality

For reference, the Software Architecture of the MIT/LL MIAWS Prototype is provided in Figure 3-11, and the Major Software Processing Units and their functionality are listed in Figure 3-12.

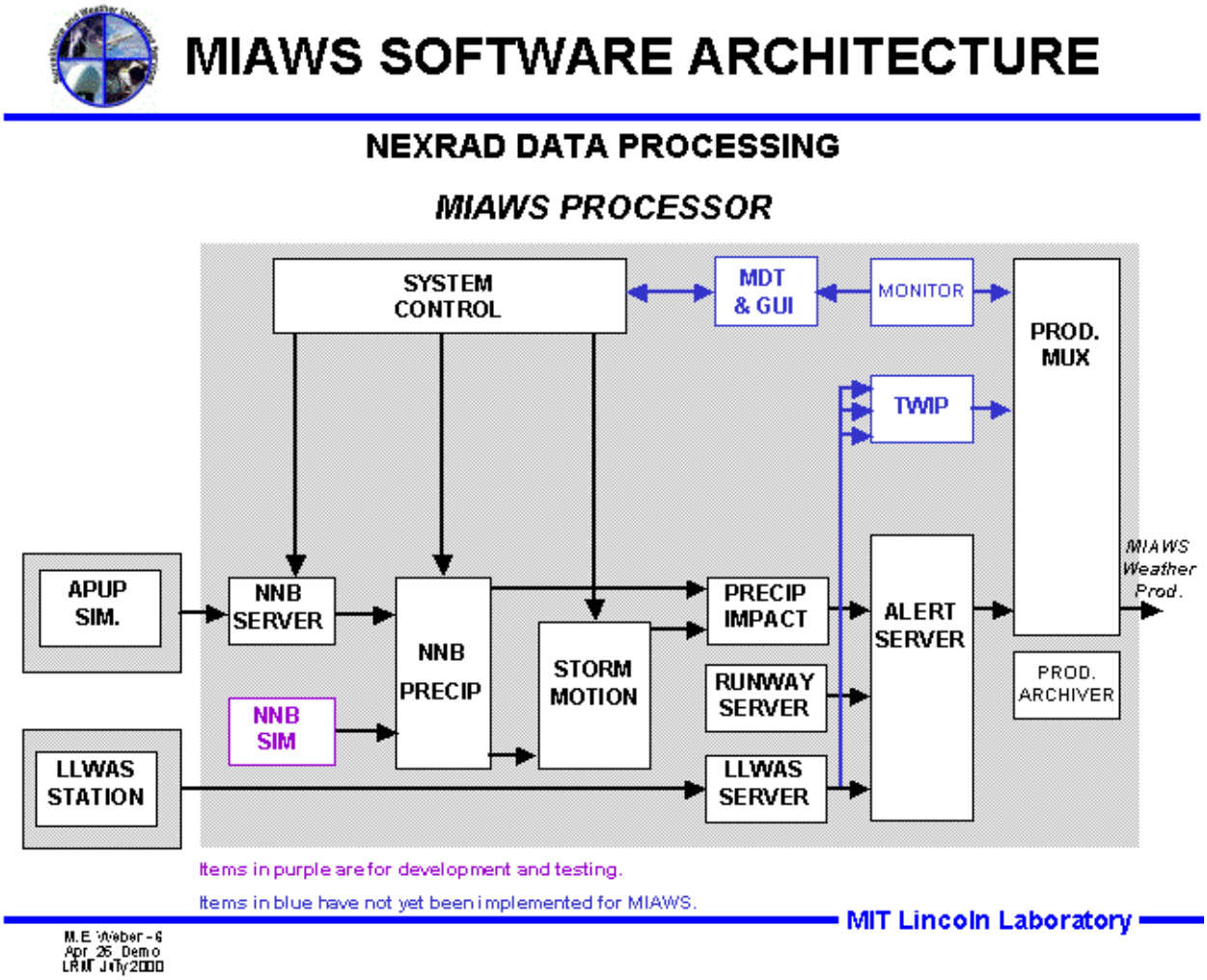

Figure 3-11: MIT/LL MIAWS Prototype Software Architecture

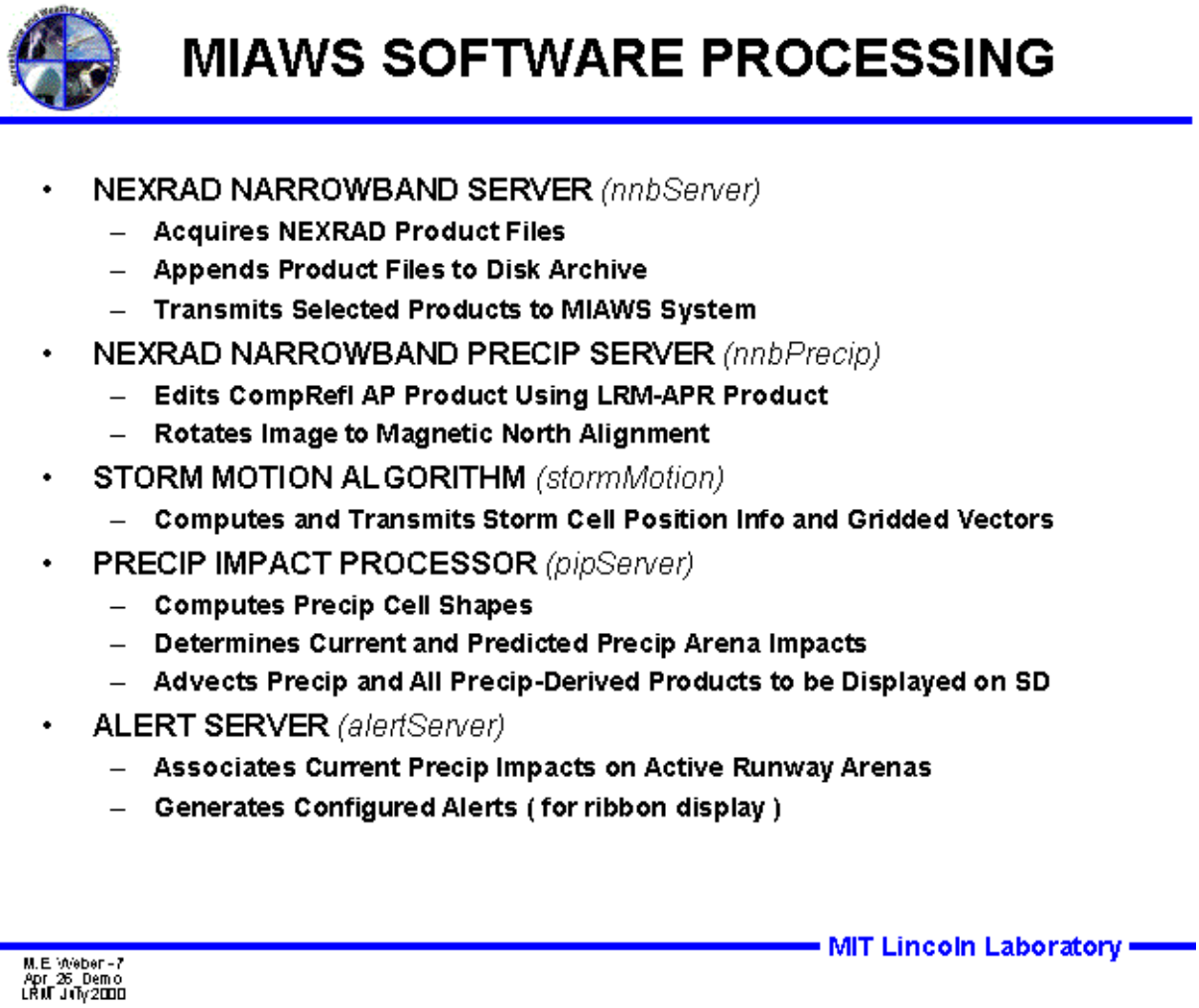

Figure 3-12: MIT/LL MIAWS Prototype Major Software Processing Units/Functionality

3.1.4.7 Processing/Utilization Requirements

Each MIAWS processing resource shall meet the following reserves, while MIAWS is ingesting and processing a Government-furnished peak load "worst case" weather scenario and meeting all requirements of this specification.

3.1.4.7.1 CPU Utilization

The MIAWS shall be sized to have a CPU reserve of at least 70% for the fly-off version of the system and at least 50% for the production version of the system operating at full operational service.

3.1.4.7.2 Memory Utilization

The MIAWS shall be sized to have a memory reserve of at least 70% for the fly-off version of the system and at least 50% for the production version of the system operating at full operational service.

3.1.4.7.3 Storage Utilization

The MIAWS shall be sized to have a storage reserve of at least 70% for the fly-off version of the

system and at least 50% for the production version of the system operating at full operational service.

3.1.5 Scalability

MIAWS shall have the capacity, functionality, and capability to support at least one ATCT position, one TRACON position, and one Maintenance Display Terminal (MDT) for each facility.

3.1.6 External Users

MIAWS shall have the capability for expansion to include the eventual display of weather products to a limited set of external users.

3.1.7 Interface Requirements

The Contractor shall meet all applicable security requirements contained in FAA Order 1370.82.

3.1.7.1 External Interfaces

3.1.7.1.1 External Systems Description

3.1.7.1.1.1 NEXRAD

The MIAWS shall interface with the NEXRAD IAW the MIAWS/NEXRAD NAS-IR-XXXXXXXX.

3.1.7.1.1.2 LLWAS-II

The MIAWS shall interface to LLWAS-II IAW the MIAWS/LLWAS-II NAS-IR-XXXXXXXX.

3.1.7.1.1.3 IDS

The MIAWS shall interface to IDS IAW the MIAWS/IDS NAS-IR-XXXXXXXX. ***[????]***

3.1.7.1.2 External Interface Protection

The MIAWS shall ingest NEXRAD and LLWAS products without degrading the product quality, or affecting the operation of, the NEXRAD or LLWAS. In interfacing with IDS, MIAWS will not interfere with the performance of other functionality of this display system.

3.1.7.1.3 Hardware-to-Hardware External Interfaces

3.1.7.1.3.1 Physical Protocol

The physical-level protocol shall support the following interfaces:

(a) RS-232.

(b) EIA-530.

(c) IEEE 802.3

3.1.7.1.3.2 Interface Configuration

The following MIAWS communication ports shall be defined:

a. NEXRAD interface,

b. LLWAS-II interface,

c. IDS Interface ***[????]***

d. Spare ports totally a minimum of twelve in number (for TWIP, ASR-11, redundant NEXRAD interface, External Users, and other uses).

3.1.7.2 Telecommunications Infrastructure

Telecommunications infrastructure supporting MIAWS shall comply with FAA-STD-29D, FAA Order 4441.16, and FAA Order 6000.36.

3.1.7.2.1 Display Functional Unit

The MIAWS shall provide Ethernet bridges and modems as required to support Tower and TRACON DFUs.

3.1.7.2.2 Modems

Modems shall conform to industry standards and shall be compatible with Government furnished dedicated and dial-up communication lines.

3.2 System Characteristics

3.2.1 General Physical System Requirements

The MIAWS system equipment will be located in TRACON equipment room, and the DFU equipment will be located in the TRACONs and tower cabs, where space is at a premium.

(a) **Weight Distribution**. The weight of the MIAWS equipment excluding the GSDs and RDTs shall not exceed, by more than 10 percent, the weight of the equipment in the MIT/LL MIAWS prototype. See also the weight requirements in Section 3.2.3.

(b) **Dimensional Constraints**. The physical dimensions of the MIAWS equipment shall not exceed, by more than 10 percent, the dimensions of the equipment in the MIT/LL MIAWS prototype. Figure 3-13 shows the MIT/LL MIAWS Prototype Hardware for Memphis and Jackson implementations. Physical dimensions for the Monitor housing the SD and the Equipment Rack housing other MIAWS equipment is given on the left hand-side of the figure.

(c) **Maintenance Access.** Equipment units shall provide access as needed for maintenance and repair activities.

(d) **Durability**. The structural strength and rigidity of the equipment units shall be such that common carrier handling in loading, shipping, unloading, and setting into position for installation shall not cause damage to any MIAWS component nor deformation to the equipment units.

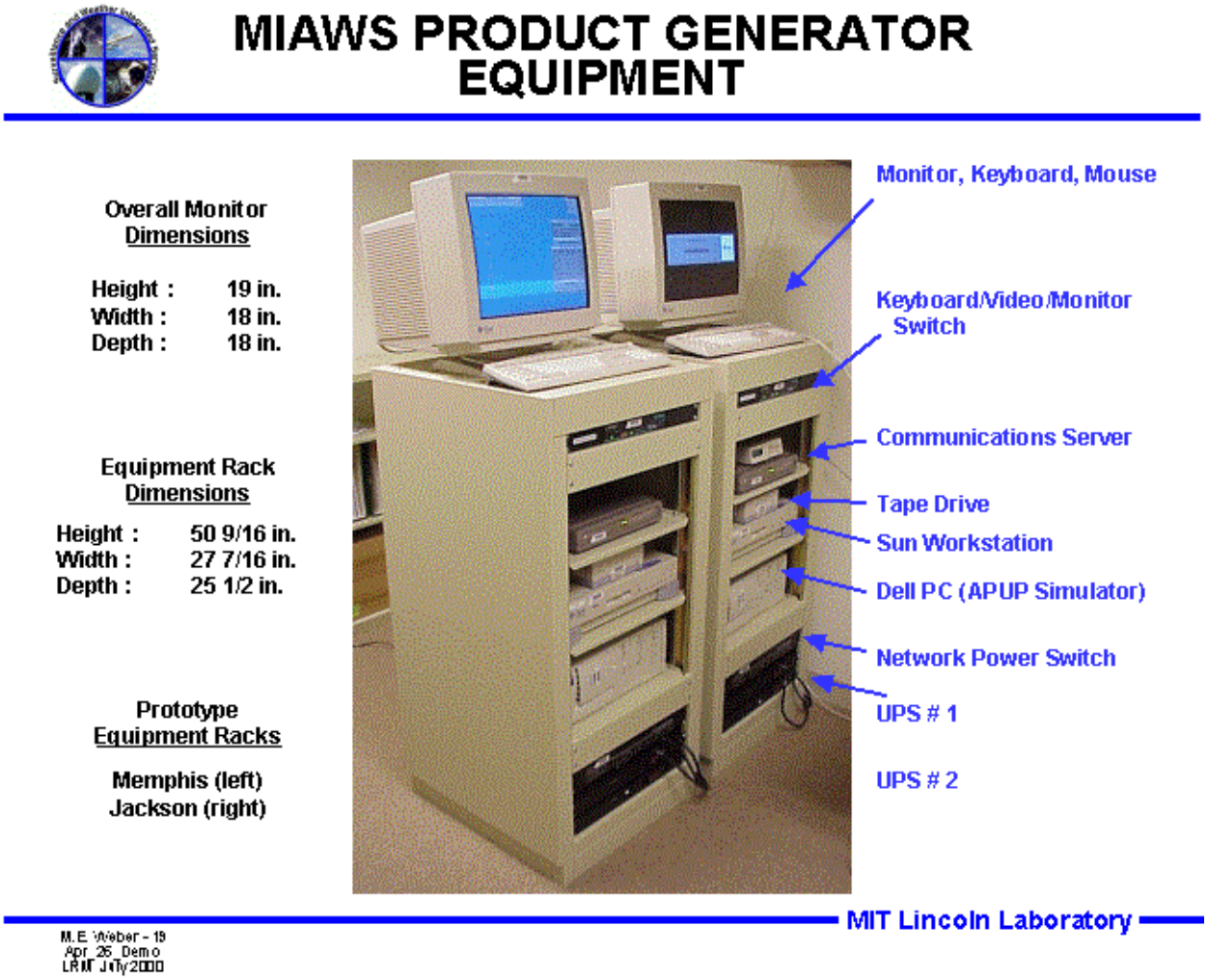

Figure 3-13: MIT/LL MIAWS Prototype Hardware (includes Dimensions for Monitor and Equipment Rack)

3.2.2 Electrical Requirements

3.2.2.1 Design Center Voltage

The design center voltages shall be 208 volts Alternating Current (AC), phase-to-phase, and 120 volts AC, single phase, at a frequency of 60 Hertz (Hz). The operating range shall be at least 102 volts to 138 volts, 177 volts to 239 volts, and 57 Hz to 63 Hz. The MIAWS shall meet the following requirements contained in FAA-G-2100F and FAA-STD-020a.

3.2.2.1.1 Power Factor

The power factor for the MIAWS shall meet the requirements contained in paragraph 3.1.2.4.2 of FAA-G-2100F.

3.2.2.1.2 Effects of Equipment on Power Source

The individual current harmonic distortion produced by the MIAWS shall not exceed the limits of table I in paragraph 3.1.2.4.3 of FAA-G-2100F.

3.2.2.1.3 Inrush Current

The inrush current produced by the MIAWS shall not exceed the limits established in paragraph 3.1.2.4.3.1 of FAA-G-2100F.

3.2.2.1.4 Transient Protection

The MIAWS shall be protected against conducted power line transients in accordance with paragraph 3.5 through 3.5.3 of FAA-STD-020a.

3.2.2.2 Maximum Power Consumption

The MIAWS equipment in the TRACON equipment room power consumption shall be less than 4***(?)*** kilowatts.

3.2.2.3 Surge Protection

Protective devices shall be provided to prevent damage to the equipment from surges on either the AC power lines, or the remote lines. The protective devices shall limit initial spikes, as might result from nearby lightning strikes, to a value that shall not damage any equipment. The protective devices shall withstand repeated surges without damage or change in operating characteristics. The protective devices shall be IAW applicable parts of paragraph 3 of FAA-STD-019, paragraph 3 of FAA-STD-020a, and applicable portions of NFPA 70, National Electrical Code ®.

3.2.2.4 Lightning Protection

MIAWS equipment shall be protected against high voltage damage due to lightning on both the power and telephone lines. MIAWS equipment interfacing with external transmission facilities shall be provided lightning surge protection of equipment IAW FAA-STD-019, FAA-STD-020a and applicable portions of NFPA 70, National Electrical Code ®.

3.2.2.5 Power and Grounding

Electrical power and grounding shall be IAW applicable portions of FAA-STD-019, FAA-STD-020a, and NFPA 70, National Electrical Code ®.

3.2.2.6 Cables

Cabling shall comply with NFPA 70 National Electrical Code ® and FAA-C-1217.

3.2.2.7 Power Systems and Commercial Power

Power required for MIAWS operations shall be provided IAW NFPA 70, National Electrical Code ®, FAA Order 6030.20, FAA Order 6950.2, and FAA Order 6950.25.

3.2.3 Human Factors

MIAWS equipment shall conform to DOT/FAA/ACT-96/1, DOT-VNTSC-FAA-95-3, and DOT/FAA/AR-99/52. MIAWS equipment and design shall comply with FAA-G-2100F. Maintainability aspects of MIAWS shall conform to Section 6 of DOT/FAA/ACT-96/1. MIAWS components shall be designed for two-person weight limits as defined in DOT/FAA/ACT-96/1. With

respect to equipment accessibility, MIAWS design and equipment shall comply with FED-STD-975. In cases of conflict between the requirements in FAA-G-2100F and DOT/FAA/ACT-96/1, requirements in DOT/FAA/ACT-96/1 shall take precedence.

3.3 Environmental Conditions

3.3.1 Operating Environment

The MIAWS system shall meet its functional and performance requirements under the environmental conditions shown in FAA-G-2100F, paragraph 3.2.1.2.2 and Table III.

3.3.2 Noise Levels

Noise levels generated by the MIAWS system shall be maintained at a level IAW with FAA Order 3900.19B.

3.3.2.1 Equipment for Operational Areas

Noise from the MIAWS system equipment located in operational areas shall not exceed 55 dB Acoustic (dBA) ambient at any time.

3.3.2.2 Equipment for Equipment Areas

Noise from the MIAWS system equipment located in general work areas shall not exceed 65 dBA, including periods when the cabinet doors are open.

3.3.3 Radiation Hazards

The following radiation requirements apply to MIAWS:

(a) X-ray radiation shall be less than 2 milliroentgen per hour at all times in any areas where normal maintenance is performed, both inside and outside cabinets.

(b) Electromagnetic radiation shall not exceed the permissible exposure limits specified in FAA-Order 3900.19B, Chapter 14.

(c) The requirements for radiation hazard, both x-ray and electromagnetic, shall apply only to those items having voltages in excess of 12,000 volts.

3.4 Safety

MIAWS shall be designed and implemented to permit compliance with Executive Order 12196, Occupational Safety and Health Program for Federal Employees; Title 29 CFR, Safety and Health Provisions for Federal Employees; and FAA Order 3900.19B.

4. QUALIFICATION REQUIREMENTS

4.1 General

a. A Quality Control system shall be established IAW ANSI/ASQC-Q-9001-1994 and IAW ISO 9000-3 and the applicable sections of the MIAWS SOW. MIAWS shall be designed and implemented such that the requirements of the quality control system shall be met.

b. A Configuration Management system shall be established IAW with the applicable sections of the MIAWS SOW. MIAWS shall be designed and implemented such that the requirements of the Configuration Management system shall be met. Reviews and audits shall be held IAW with the requirements and documents cited in the applicable sections of the MIAWS SOW.

c. Testing shall be IAW the Acquisition Management System Test and Evaluation Process Guidelines. MIAWS shall be designed and implemented such that the requirements of the Acquisition Management System Test and Evaluation Process Guidelines shall be met. Detailed requirements for testing are in the MIAWS SOW.

4.2 Verification Requirements Traceability Matrix

A Verification Requirements Traceability Matrix (VRTM) will be provided by the provided by the Government as GFE.

5. RESERVED

6. NOTES

6.1 Acronyms and Abbreviations

AC	Alternating current
AP	Anomalous Propagation
ARENA	AREa Noted for Attention
ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
BIT/BITE	Built in Test /Built in Test Equipment
COTS	Commercial Off-the-Shelf
CPU	Central Processing Unit
DA	Data Acquisition Function
dBA	dB (Decibel) Acoustic
dBZ	Reflectivity factor in decibels
DF	Display Function
DFU	Display Functional Unit
DOD	Department of Defense
DP	Data Processing Function
EIA	Electronic Industries Association
FAA	Federal Aviation Administration
FMC	Full Mission Capability
Gbytes	Gigabytes
GFI	Government Furnished Information
GFP	Government Furnished Property
GUI	Graphical User Interface
GMT	Greenwich Mean Time
Hz	Hertz
IAW	In Accordance With
IDS	***[Need decoding for this display system acronym]***
IEEE	Institute of Electrical and Electronics Engineers
IRD	Interface Requirements Document
ITWS	Integrated Terminal Weather System
LAN	Local Area Network

LLWAS	Low Level Wind Shear Alert System
LRU	Lowest Replaceable Unit
Mbytes	Megabytes
MDT	Maintenance Display Terminal
MHz	Megahertz
MIAWS	Medium Intensity Airport Weather System
MIT/LL	Massachusetts Institute of Technology/Lincoln Laboratory
MIL	Military
MNS	Mission Need Statement
MTBCF	Mean Time Between Critical Failures
MTTR	Mean Time to Restore
NAS	National Airspace System
NDI	Non-Developmental Item
NE	Northeastern
NEXRAD	Next Generation Weather Radar
NW	Northwestern
NWS	National Weather Service
ORPG	Open Radar Product Generator
PSF	Program Support Facility
RAM	Random Access Memory
RDT	Ribbon Display Terminal
SC/DF	System Control/Diagnostic Function
SD	Situation Display
SEP	Storm Extrapolated Position line (direction)
SOW	Statement of Work
SM	Storm Motion arrows and numbers (speed)
STD	Standard
SWAP	Severe Weather Avoidance Plan
TDWR	Terminal Doppler Weather Radar
TRACON	Terminal Radar Approach Control
TWIP	Terminal Weather Information for Pilots
VCP	Volume Coverage Patterns
VIP	Video Integrator and Processor

VRTM	Verification Requirements Traceability Matrix
WSP	Weather Systems Processor

6.2 Definitions

6.2.1 Alarm

An alarm is a MIAWS generated response to a condition that requires immediate attention. The MIAWS provides visual weather product alarms that are generated in response to a detected hazardous weather condition in a pre-selected area of concern.

6.2.2 Visual Alarms

Visual alarms are those generated from the MIAWS hardware and software that can be seen by ATC personnel and that will alert ATC personnel of hazardous conditions.

6.2.3 Availability

Availability is the probability that the MIAWS will be at Full Mission Capability (FMC) during any and all required operating times.

6.2.4 BIT/BITE

BIT/BITE are those items of built-in-test-equipment and their respective built-in-tests that perform internal testing of the MIAWS.

6.2.5 Certification Test

A certification test is performed after any maintenance action that affects two or more certification parameters or whenever the system integrity is in question.

6.2.6 Certification Test Data

Certification Test Data is a set of system performance parameters used to validate that the system can be placed in operational use.

6.2.7 Corrective Maintenance

Corrective maintenance consists of those actions directly related to correcting a failure. Corrective maintenance does not include administrative or travel activities.

6.2.8 Critical Failure

A critical failure is any failure that degrades the MIAWS FMC.

6.2.9 dBZ

The term dBZ refers to the radar reflectivity factor of weather scatterers, expressed in decibels.

6.2.10 Equipment

Equipment is defined as a complete operating assembly, either operating independently or within a system or subsystem.

6.2.11 Technical Instruction Books

Technical Instruction Books are the technical manuals that include the equipment drawings, parts lists, and methods of isolating faults and repairing them.

6.2.12 Failure

A failure is any event that causes the MIAWS system not to meet any requirement of this specification.

6.2.13 Full Mission Capability

Full Mission Capability is the level of performance that allows the MIAWS to perform its mission within the requirements of this specification.

6.2.14 Gross Weight

Gross weight is the maximum possible weight of the enclosure and its contents.

6.2.15 Inherent Availability

Inherent availability is a measure of the availability that excludes the logistics delay time and administrative delay time.

6.2.16 Lowest Replaceable Unit (LRU)

An LRU consists of one or more electronic/mechanical subassemblies and assemblies, as defined in MIL-STD-280 and applicable parts of MIL-STD-1388-2, and excludes items falling under the definition for a part as given in MIL-STD-280. ***[Does this definition require updating?]***

6.2.17 Maintenance Depot

The maintenance depot is the FAA Depot at Oklahoma City, Oklahoma. Depot-level maintenance consists of those maintenance activities performed on unserviceable repairable LRUs and system support/test equipment requiring specialized skills and equipment. The tasks performed at this level are those tasks that are not specifically assigned to the organizational level of maintenance. When the specification states that repair will be at the depot, the actual repair may be at the depot or at a contractor's location.

6.2.18 Mean Time Between Critical Failures

Mean Time Between Failure (MTBCF) is the total FMC time divided by the total number of failures that require corrective maintenance.

6.2.19 Mean Time To Restore

The Mean Time to Restore (MTTR) includes the time to remove and replace an identified faulty LRU, perform system test, and return the system to FMC.

6.2.20 Preventive Maintenance

Preventive maintenance consists of those maintenance activities performed to ensure that the MIAWS maintains its FMC and to prevent future in-service functional failure of equipment.

6.2.21 Site Level Maintenance

Site Level Maintenance is maintenance performed at this level on systems, system segments, and support equipment in direct support of the MIAWS System. It includes system maintenance monitoring, system fault isolation, and correction of system failures through the removal and replacement of LRUs and preventive maintenance, but does not include repair, service, calibration, and verification of the removed LRUs.

6.2.22 Software Errors

[TBD]

APPENDIX A - RESERVED

APPENDIX B - RESERVED

APPENDIX C - DISPLAY REQUIREMENTS

This appendix describes requirements for displays to be provided with the MIAWS. The requirements of this section apply in addition to requirements in Section 3.

30.1 SD Physical Requirements

30.1.1 Specific SD Requirements

The MIAWS SD shall use flat panel color display technology. The viewing screen of the SD shall be at least 19 inches measured diagonally. The minimum resolution shall be 1024 (horizontal) x 768 (vertical) pixels. The refresh rate shall be between 60-85 Hz. The SD shall be capable of being viewed from an angle up to 85 degrees off-center. The NEC Flat Screen Multisync LCD1810X Monitor meets these specifications.

30.1.2 Input Devices

A track ball or mouse with three push button switches shall provide operator command input. MIAWS shall have an alphanumeric keyboard. The alphanumeric keyboard shall be required only for maintenance actions. The leftmost push button switch on the track ball or mouse shall be the main activator for track ball/mouse operations. The middle and rightmost push button switches on the track ball or mouse shall be reserved for future applications.

30.1.3 Proximity of Input Device

SD input devices (keyboard, track-ball, mouse) shall be able to operate at a distance of at least five (5) feet from the SD monitor.

30.1.4 Recovery from Power-Down or Inadvertent Power Loss

MIAWS shall recover from a powering down or an inadvertent loss of power with no loss of data. Upon recovery MIAWS display and adaptation data settings shall be restored to what they were before the powering down or the inadvertent loss of power. The SD shall retain the following display adaptation parameters and settings during power outages and shutdown: the SD shall retain the chosen outer range, the chosen overlays, the background colors and the chosen precipitation levels inhibited. The SD shall power up with these retained display adaptation parameters. The MIT/LL MIAWS Prototype GFI software may not fully provide the capabilities to comply with the requirements in this paragraph. Modifications shall be made to the GFI software as necessary to comply with these requirements. Such modifications shall be identified to the Government during Design Reviews.

30.1.5 Brightness Control

The SD shall have a brightness control, with minimum and maximum brightness capabilities equivalent to the NEC Flat Screen Multisync LCD1810X Monitor used in the MIT/LL MIAWS prototype.

30.1.6 Contrast Control

The SD shall have a contrast control with minimum and maximum contrast capabilities equivalent to the

equipment NEC Flat Screen Multisync LCD1810X Monitor used in the MIT/LL MIAWS prototype.

30.1.7 Visual Alarms

The SD shall provide a visual alarm to indicate new hazards or significant weather events, using the GFP algorithms and functionality from the MIT/LL MIAWS prototype.

30.1.8 Power

Power for the SD shall be single phase, 60 Hz, 120 volts AC. Power consumption shall be less than 2000 watts.

30.1.9 Maps

The SD shall accept and display background maps and an airport map with up to 1000 segments and 100 characters that are provided. Video maps shall be operator selectable with reference points. MIAWS shall have a video map switching function without disrupting the system. These requirements shall be implemented in the same fashion as, and using the same GFP algorithms as, the MIT/LL MIAWS Prototype.

30.2 Detailed SD Display Requirements

The SD shall display all the product display windows, pulldown menus, and popup windows described in the following subsections, in the same fashion as, and using the same GFP algorithms as, the MIT/LL MIAWS Prototype. In the subsections that follow, windows and pulldown windows are described in the following order: product display windows, pulldown menus ordered from left to right (as they appear on the Main SD Window) with pulldown submenus arranged in top-to-bottom order within their parent pulldown menus, then popup windows in the order they are invoked from the pulldown menus.

30.2.1 Main SD Window

The Main SD window shall be configured as in Figure 30-1.

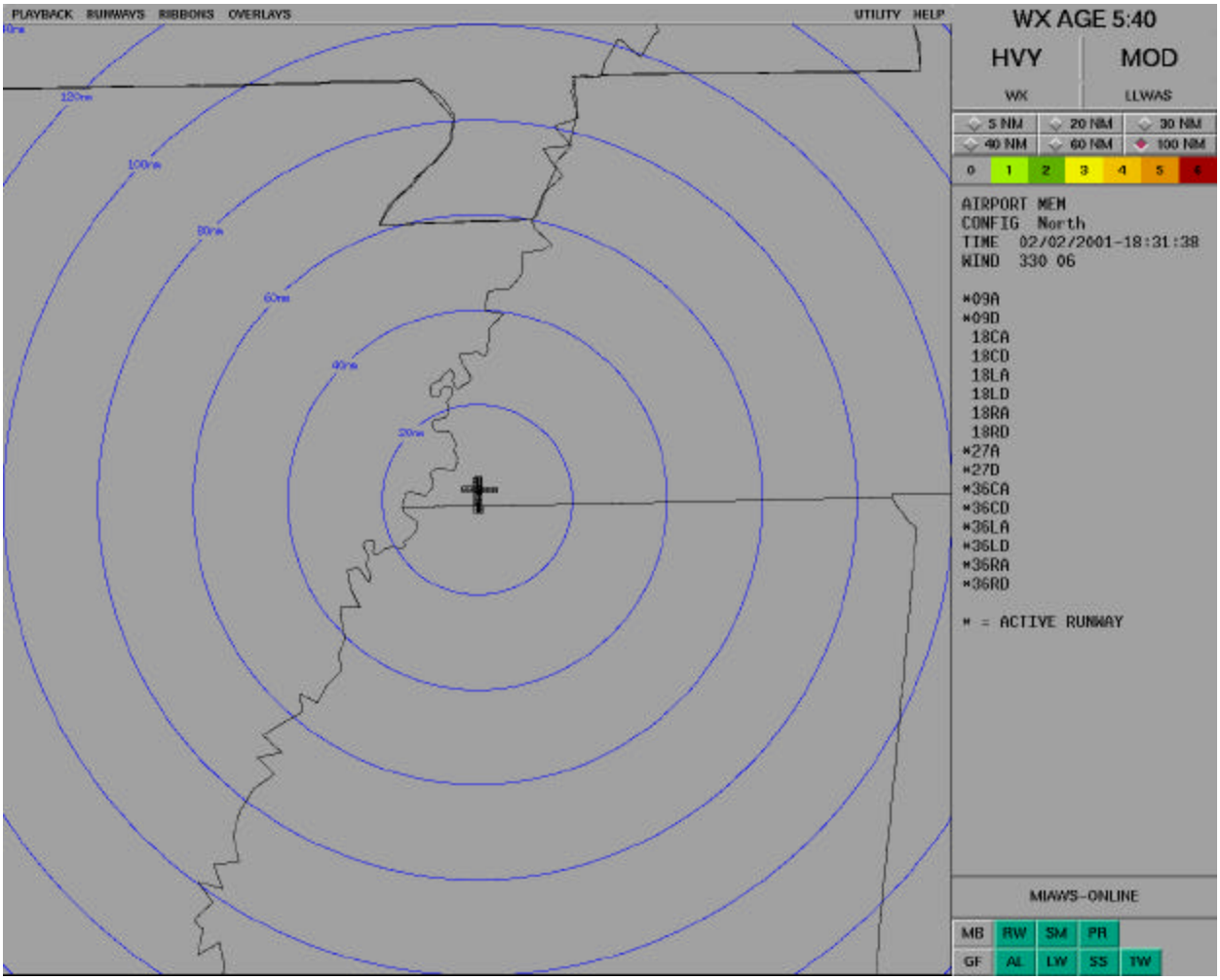

Figure 30-1: Main SD Window

30.2.2 SD Product Displays

30.2.2.1 Alert SD Window

The Alert SD window shall be configured as in Figure 30-2. Processing associated with the Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

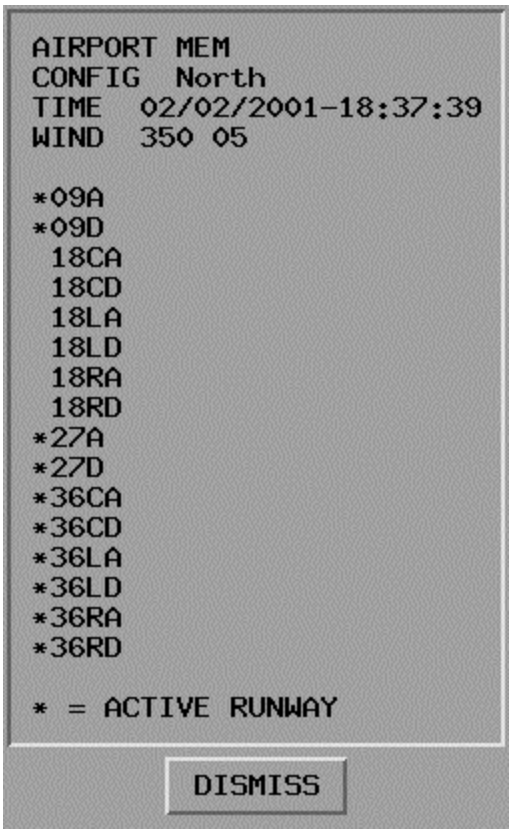

Figure 30-2: Alert SD Window

30.2.2.2 Precipitation Statistics SD Window

The Precipitation Statistics SD window shall be configured as in the top and bottom portions of Figure 30-3, to include only these items: PRECIP STATISTICS (from the top), SD Time (from the top), Advection Scoring Statistics (from the bottom), CSI Average Count (from the bottom), CSI Average Time Span (from the bottom), Average Level 2 CSI (from the bottom), Average Level 3 CSI (from the bottom), and the DISMISS button (from the bottom). Processing associated with the Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype, except that the GFP Display algorithms shall be modified to include only the items specified above. The capabilities in the MIT/LL MIAWS Prototype GFP algorithms for the Precipitation Statistics SD Window that are not to be implemented in the flyoff version of MIAWS shall be disabled, but not removed, from the algorithms delivered as part of the flyoff version of the MIAWS software. Such modifications shall be identified to the Government during Design Reviews.

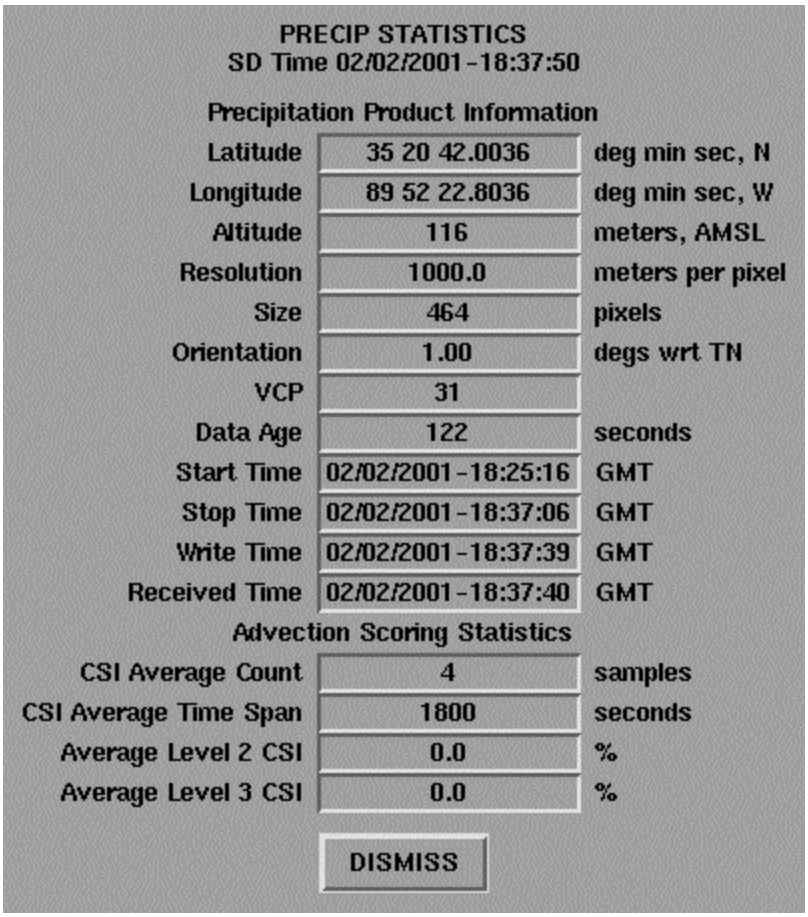

Figure 30-3: Precipitation Statistics SD Window

30.2.2.3 Runway Configuration SD Window

The Runway Configuration SD window shall be configured as in Figure 30-4. Processing associated with the Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

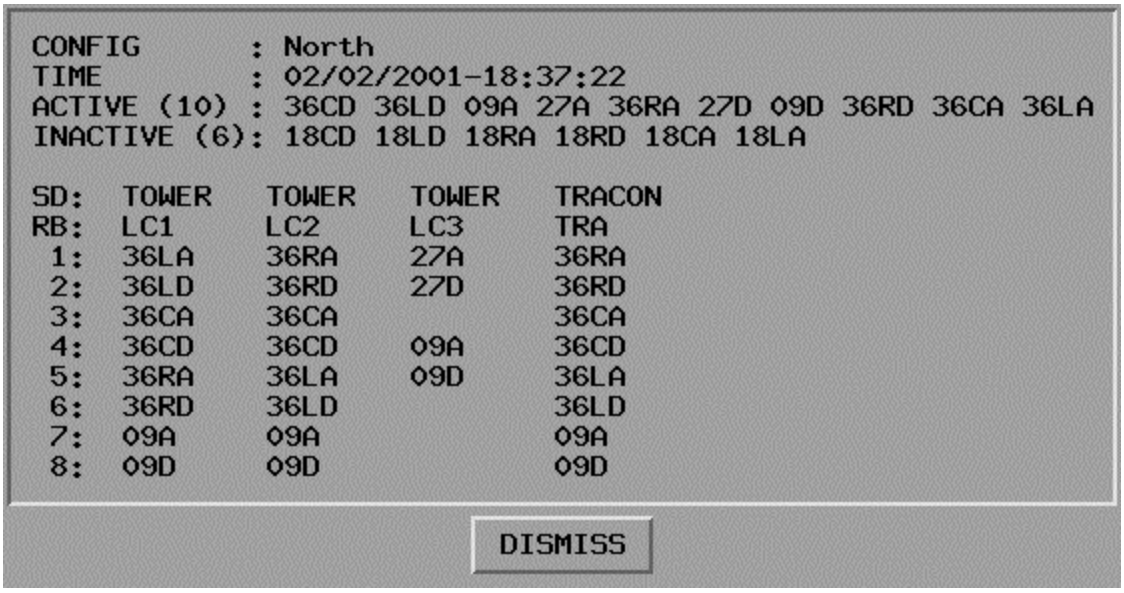

Figure 30-4: Runway Configuration SD Window

30.2.2.4 System Status SD Window

The System Status SD window shall be configured as in Figure 30-5. Processing associated with the Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

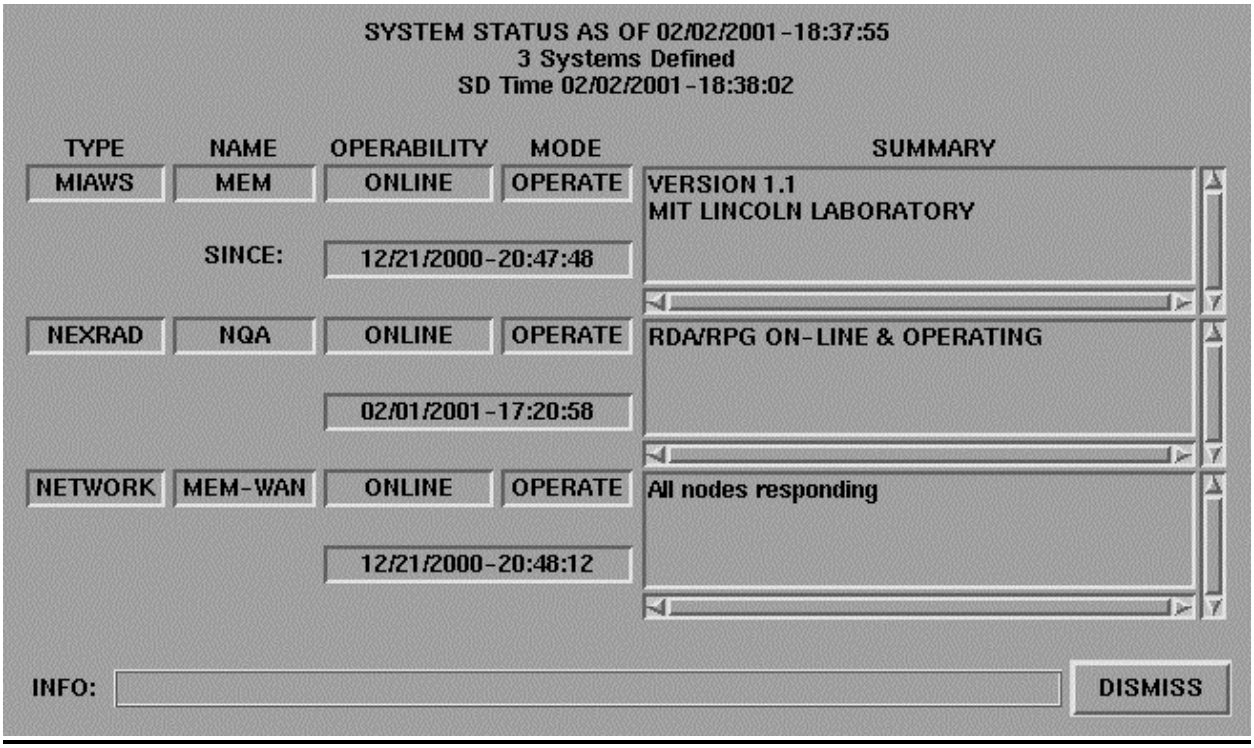

Figure 30-5: System Status SD Window

30.2.3 SD Pulldown Menus

30.2.3.1 SD Pulldown Playback Menu

The SD Pulldown Playback Menu shall be configured as in Figure 30-6. Implementation of the item selected from the menu shall be provided as per the MIT/LL MIAWS Prototype.

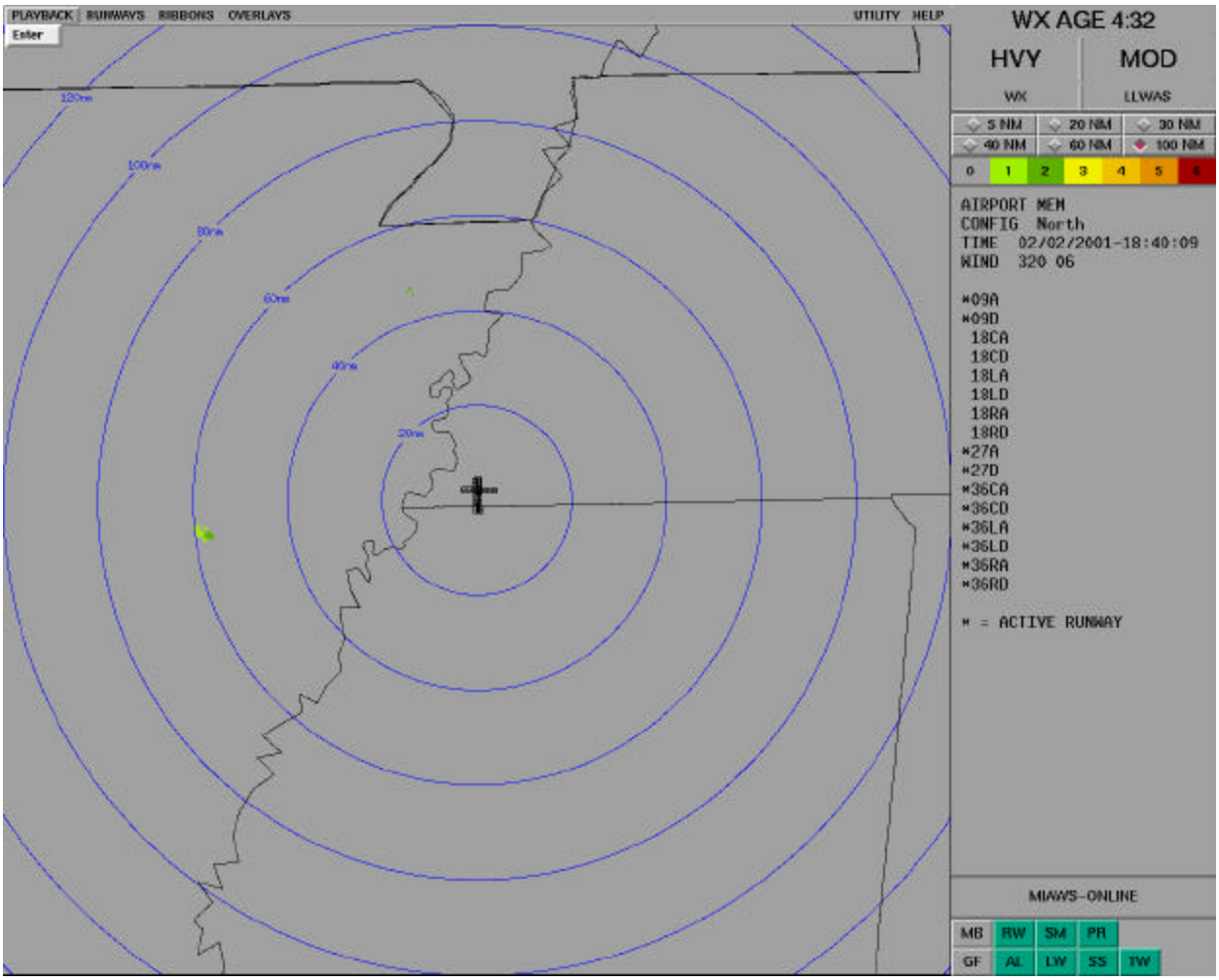

Figure 30-6: SD Pulldown Playback Menu

30.2.3.2 SD Pulldown Runways Menu

The SD Pulldown Runways Menu shall be configured as in Figure 30-7. Implementation of the items selected from the menu shall be provided as per the MIT/LL MIAWS Prototype.

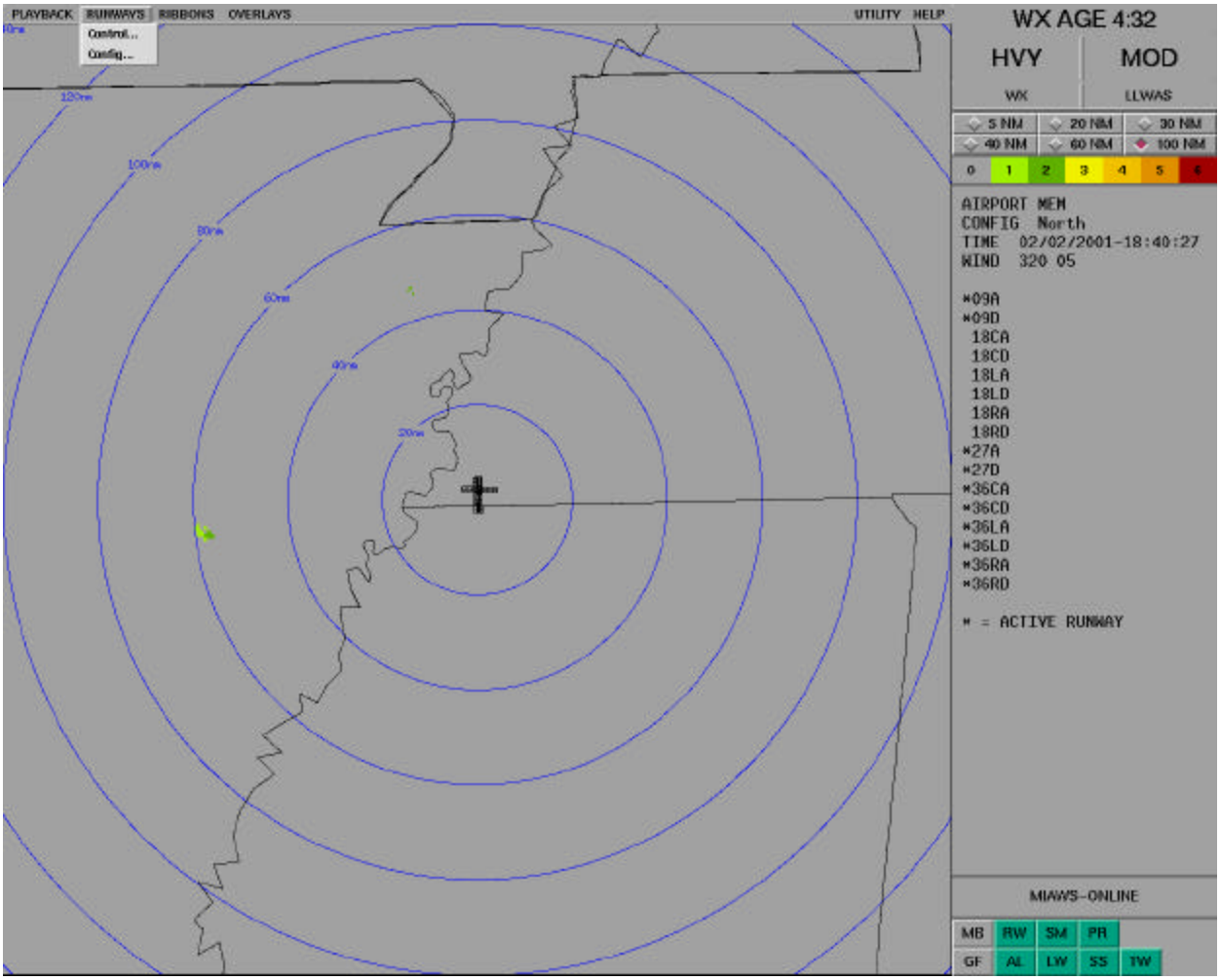

Figure 30-7: SD Pulldown Runways Menu

30.2.3. 3 SD Pulldown Ribbon Display Menu

The SD Pulldown Ribbon Display Menu shall be configured as in Figure 30-8. Implementation of the items selected from the menu shall be provided as per the MIT/LL MIAWS Prototype.

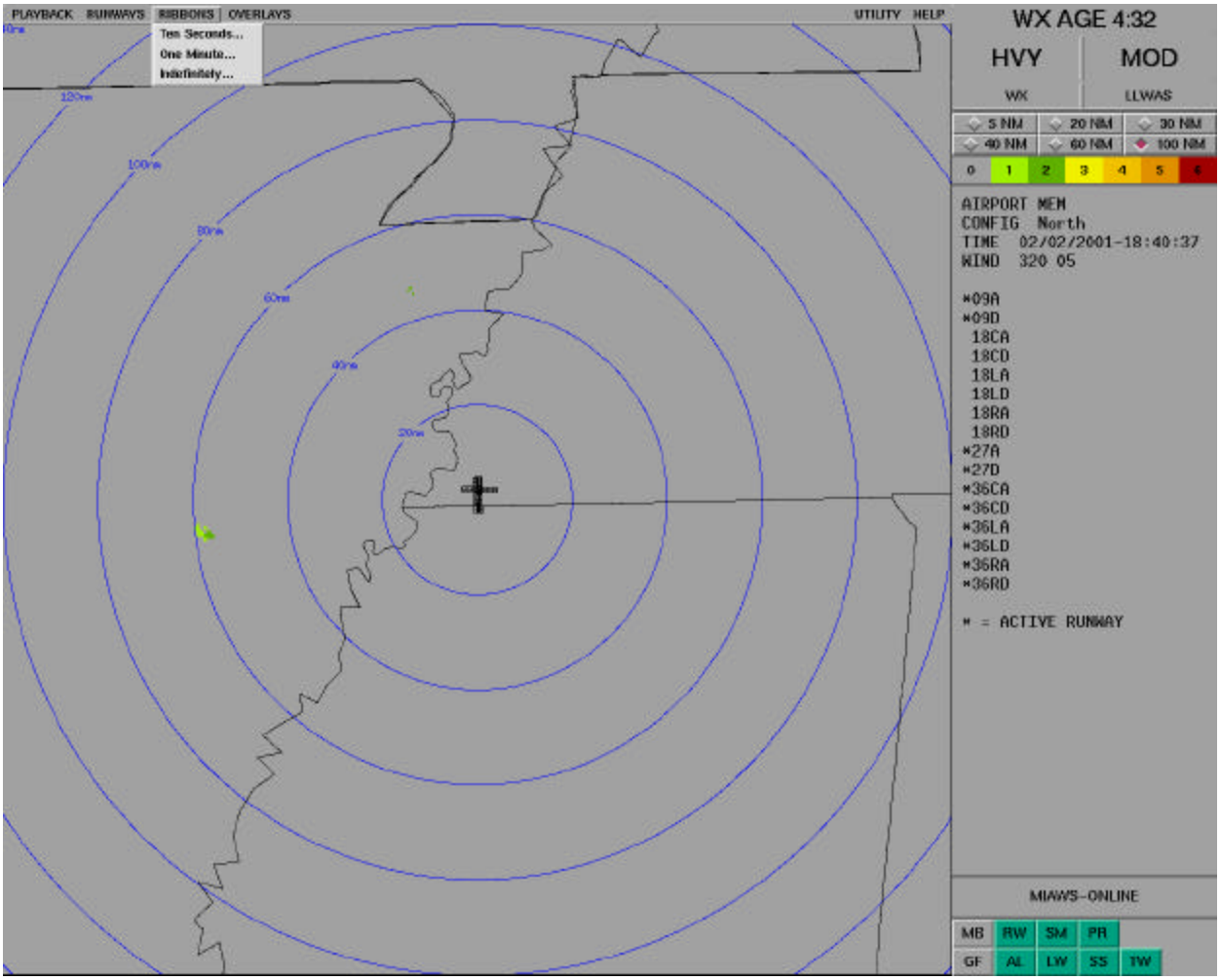

Figure 30-8: SD Pulldown Ribbon Display Menu

30.2.3.4 SD Pulldown Overlays Menu

The SD Pulldown Overlays Menu shall be configured as in Figure 30-9. Implementation of the items selected from the menu shall be provided as per the MIT/LL MIAWS Prototype.

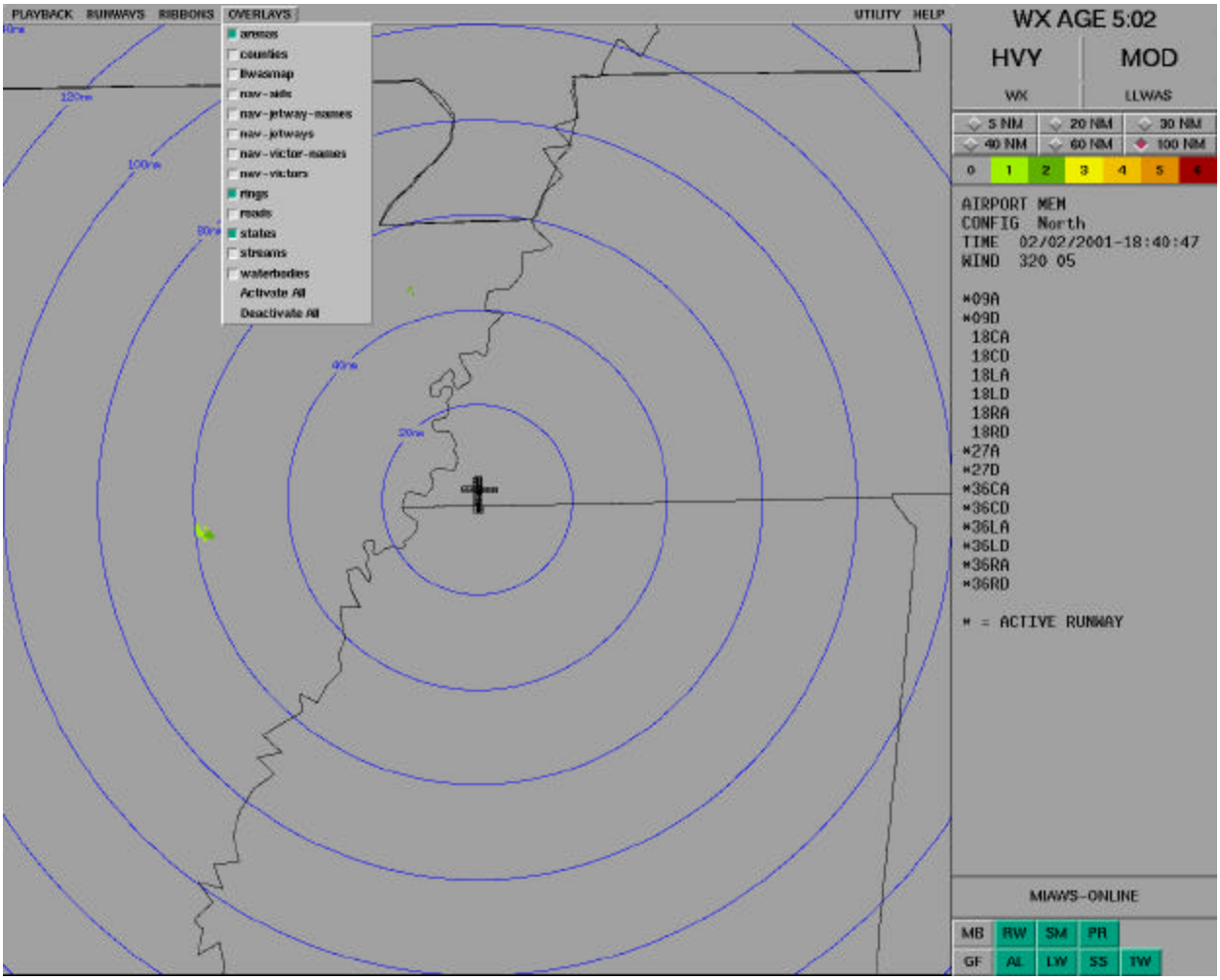

Figure 30-9: SD Pulldown Overlays Menu

30.2.3.5 SD Pulldown Utilities Menu

The SD Pulldown Utilities Menu shall be configured as in Figure 30-10. Implementation of the Selections, and Locator items selected from the menu shall be provided as per the MIT/LL MIAWS Prototype. "E-Mail" shall be removed from the Utilities Menu. The "E-Mail" capabilities in the MIT/LL MIAWS Prototype GFP display algorithms shall not be implemented in the flyoff version of MIAWS and shall be disabled, but not removed, from the algorithms delivered as part of the flyoff version of the MIAWS software. Such modifications shall be identified to the Government during Design Reviews.

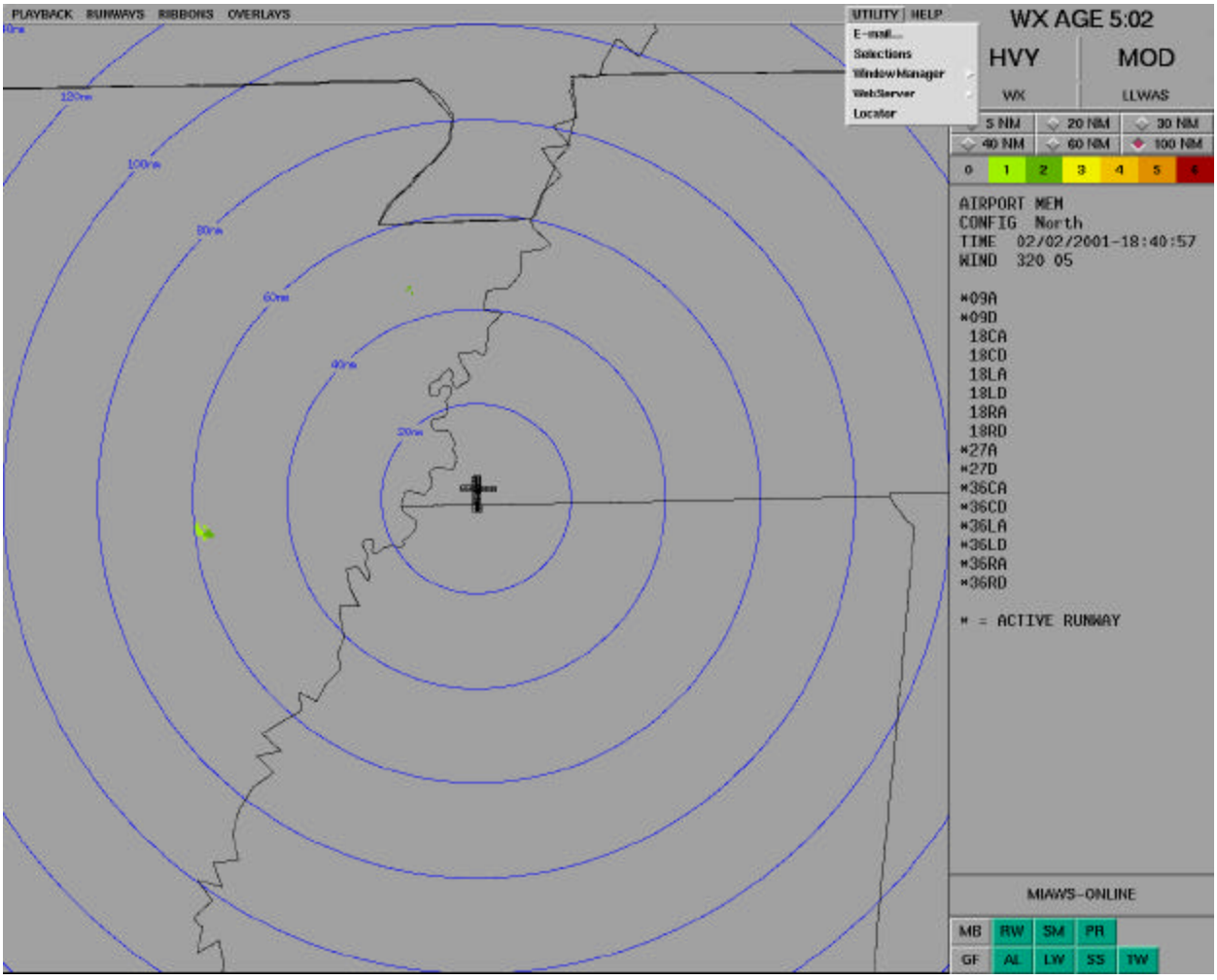

Figure 30-10: SD Pulldown Utilities Menu

30.2.3.6 SD Pulldown Utilities Menu for the Window Manager

The SD Pulldown Utilities Menu for the Window Manager shall be configured as in Figure 30-11. Implementation of the items selected from the menu (Reset and Enable/Disable) shall be provided as per the MIT/LL MIAWS Prototype.

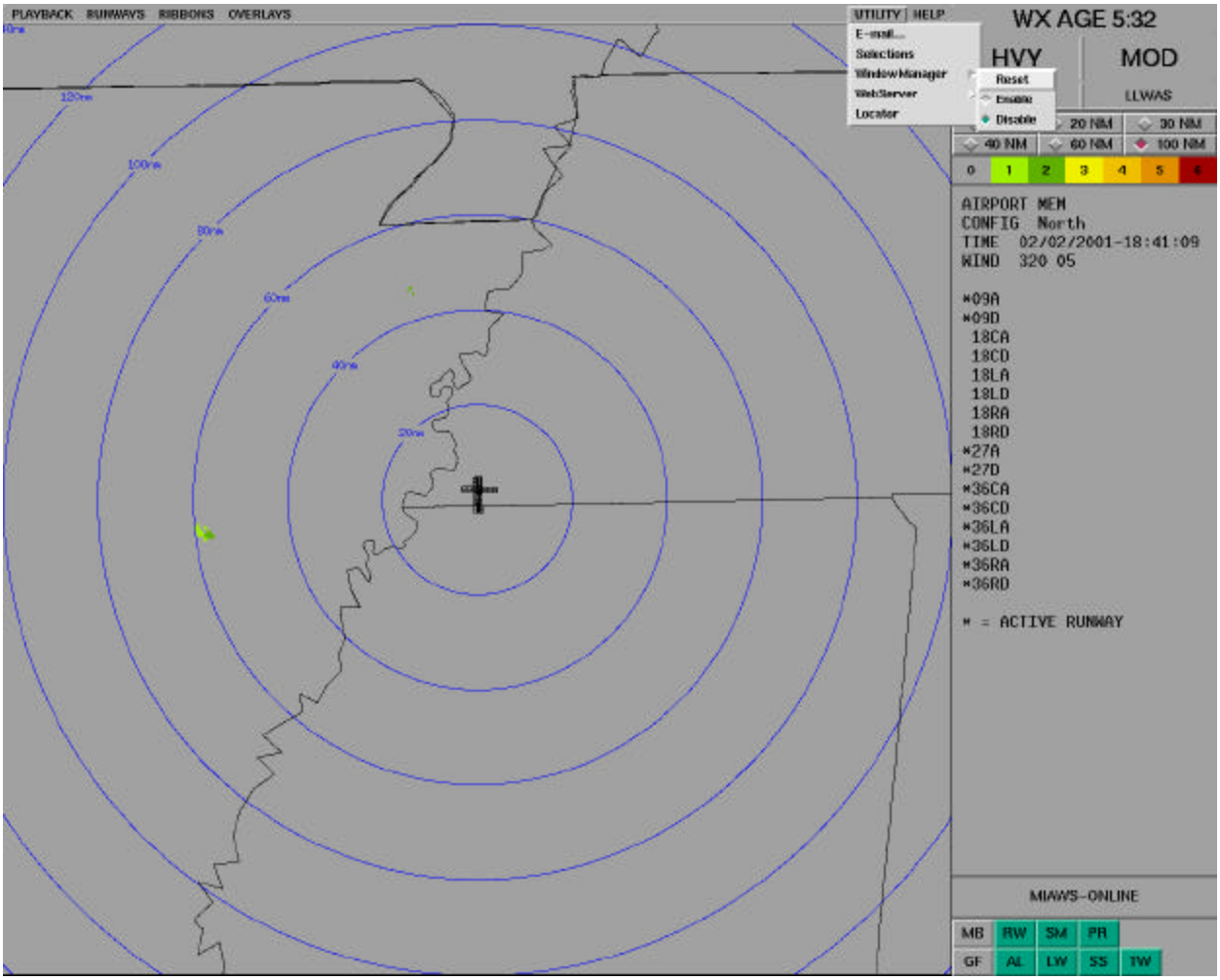

Figure 30-11: SD Pulldown Utilities Menu for the Window Manger

30.2.3.7 SD Pulldown Utilities Menu for the Web Server

The SD Pulldown Utilities Menu for the Web Server shall be configured as in Figure 30-12. Implementation of the items selected from the menu (Enable/Disable) shall be provided as per the MIT/LL MIAWS Prototype.

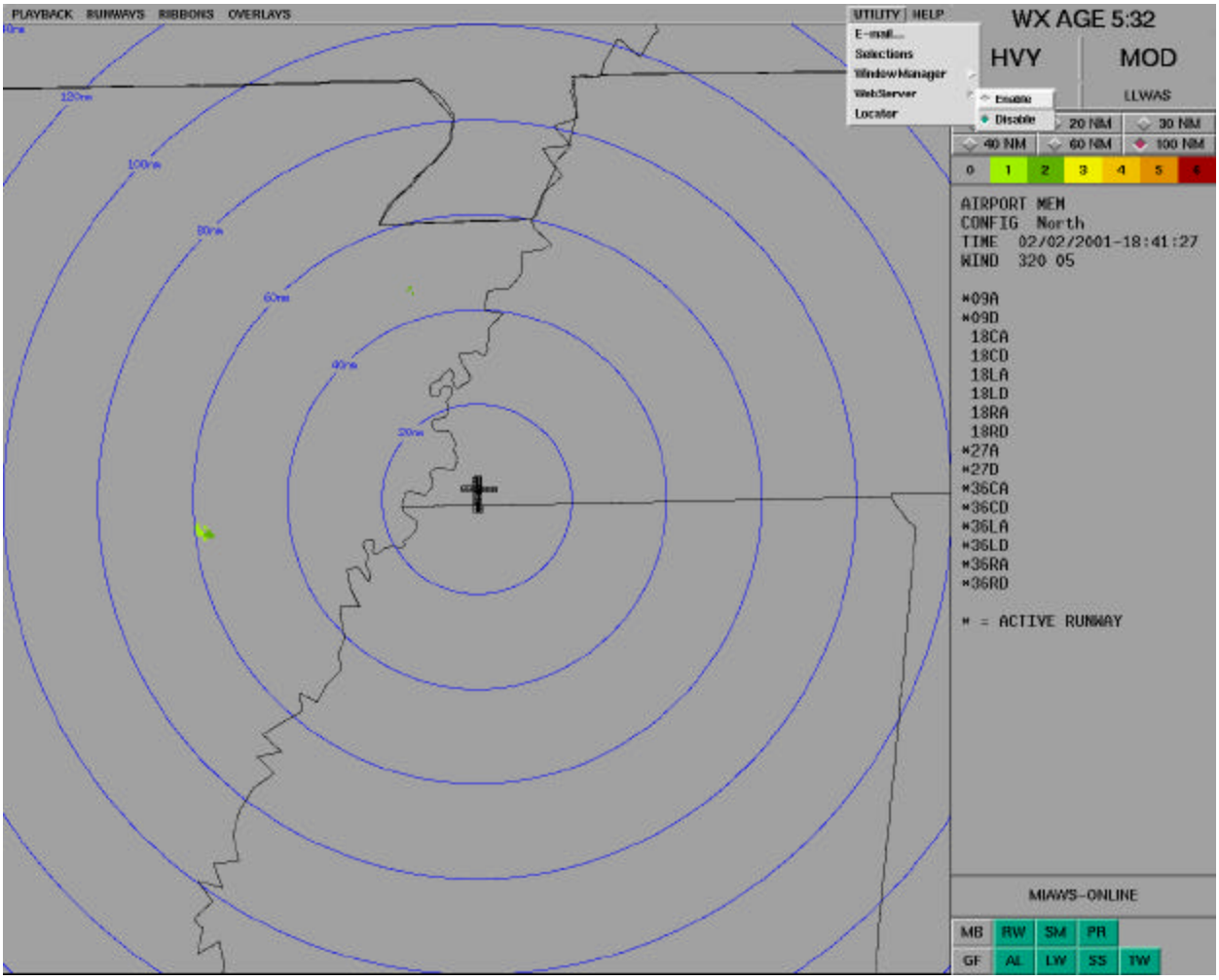

Figure 30-12: SD Pulldown Utilities Menu for the Web Server

30.2.3.8 SD Pulldown Programs Help Menu

The SD Pulldown Programs Help Menu shall be configured as in Figure 30-13, except that the entries for "WSP" and "MIT/LL" shall be removed (their associated submenus shall be disabled but retained in the delivered software as per the requirement in the last sentence of this section). The entry on the Programs Help Menu for "RBDT" shall be changed to "RDT" and shall be "grayed-out" (its associated submenu shall be disabled but retained in the delivered software as per the requirement in the last sentence of this section). Operational associated submenus shall be provided with the flyoff version of the MIAWS software as per the MIT/LL MIAWS Prototype for "MIAWS" and the "SD". Processing associated Programs Help Menu and subordinate Windows shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype, except for the changes indicated above. Those capabilities in the MIT/LL MIAWS Prototype GFP algorithms that are not to be implemented in the flyoff version of MIAWS shall be disabled, but not removed, from the algorithms delivered as part of the flyoff version of the MIAWS software. Such modifications shall be identified to the Government during Design Reviews.

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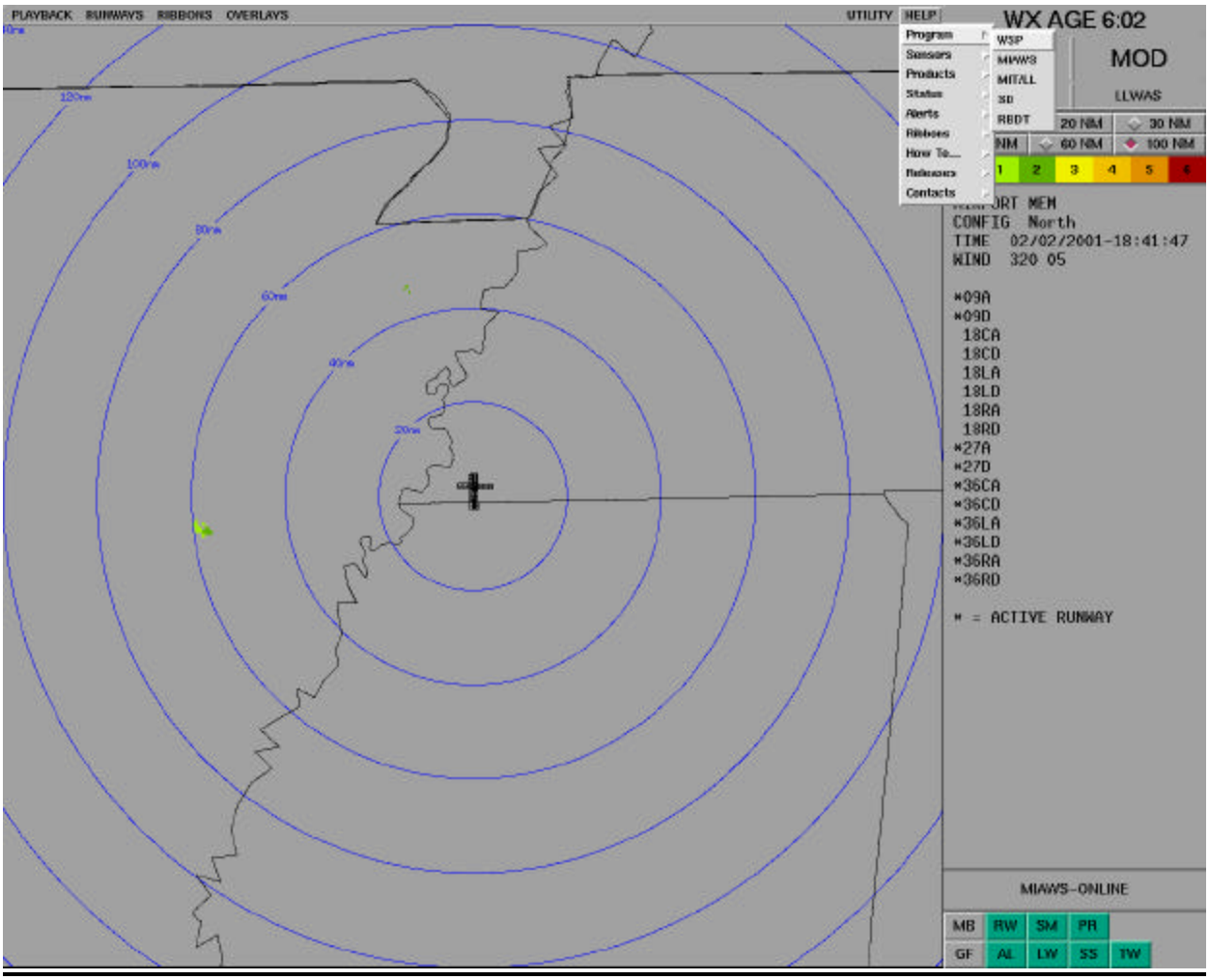

Figure 30-13: SD Pulldown Programs Help Menu

30.2.3.9 SD Pulldown Sensors Help Menu

The SD Pulldown Sensors Help Menu shall be configured as in Figure 30-14, except that the entries for "ASR-11" and "ASOS" shall be "grayed-out" (their associated submenus shall be disabled but retained in the delivered software as per the requirement in the last sentence of this section). Operational associated submenus shall be provided as per the MIT/LL MIAWS Prototype for "NEXRAD" and "LLWAS". Processing associated with the Sensors Help Menu and subordinate Windows shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype, except for the changes indicated above. Those capabilities in the MIT/LL MIAWS Prototype GFP algorithms that are not to be implemented in the flyoff version of MIAWS shall be disabled, but not removed, from the algorithms delivered as part of the flyoff version of the MIAWS software. Such modifications shall be identified to the Government during Design Reviews.

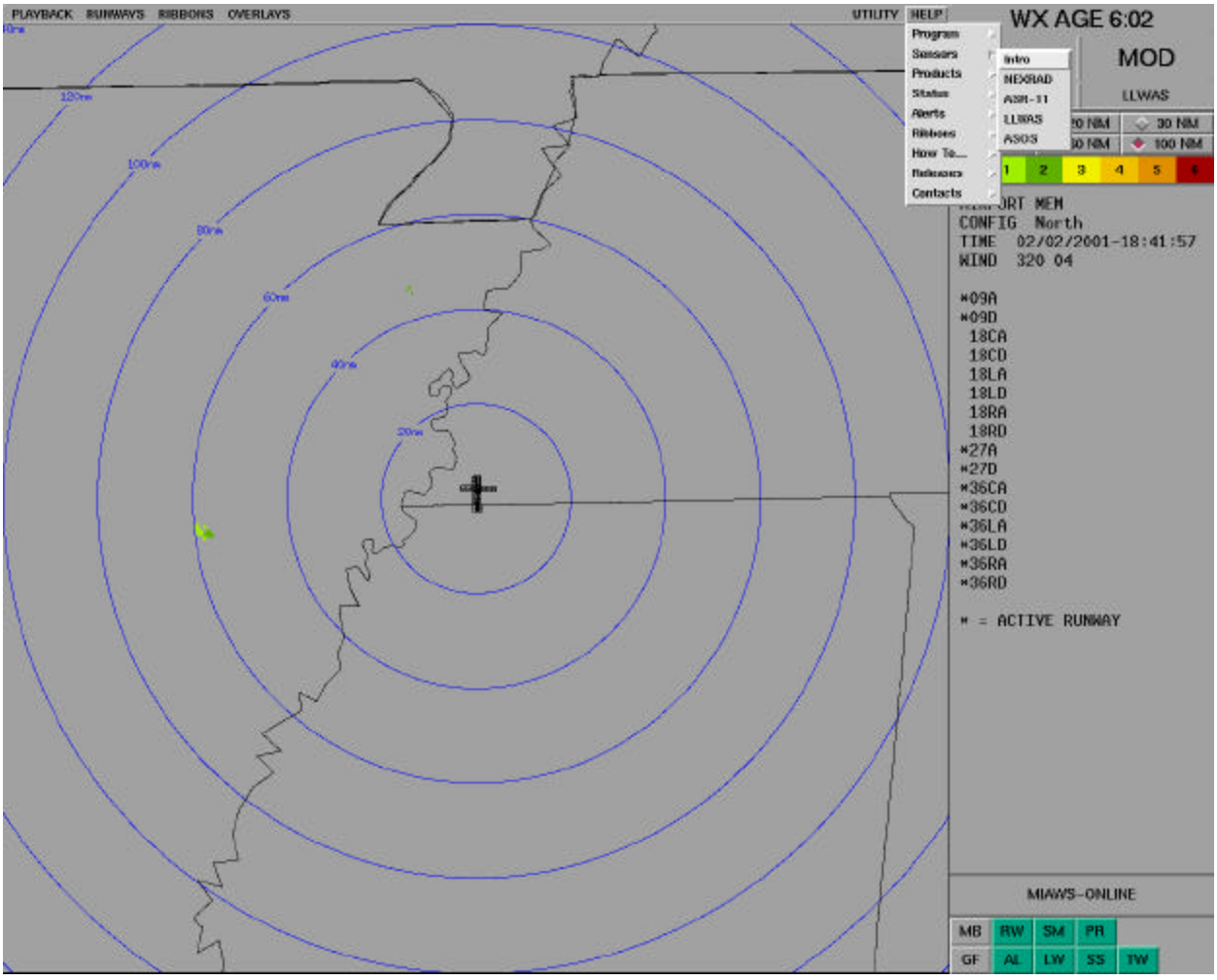

Figure 30-14: SD Pulldown Sensors Help Menu

30.2.3.10 SD Pulldown Product Help Menu

The SD Pulldown Product Help Menu shall be configured as in Figure 30-15. Associated submenus shall be provided as per the MIT/LL MIAWS Prototype. Processing associated with the Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

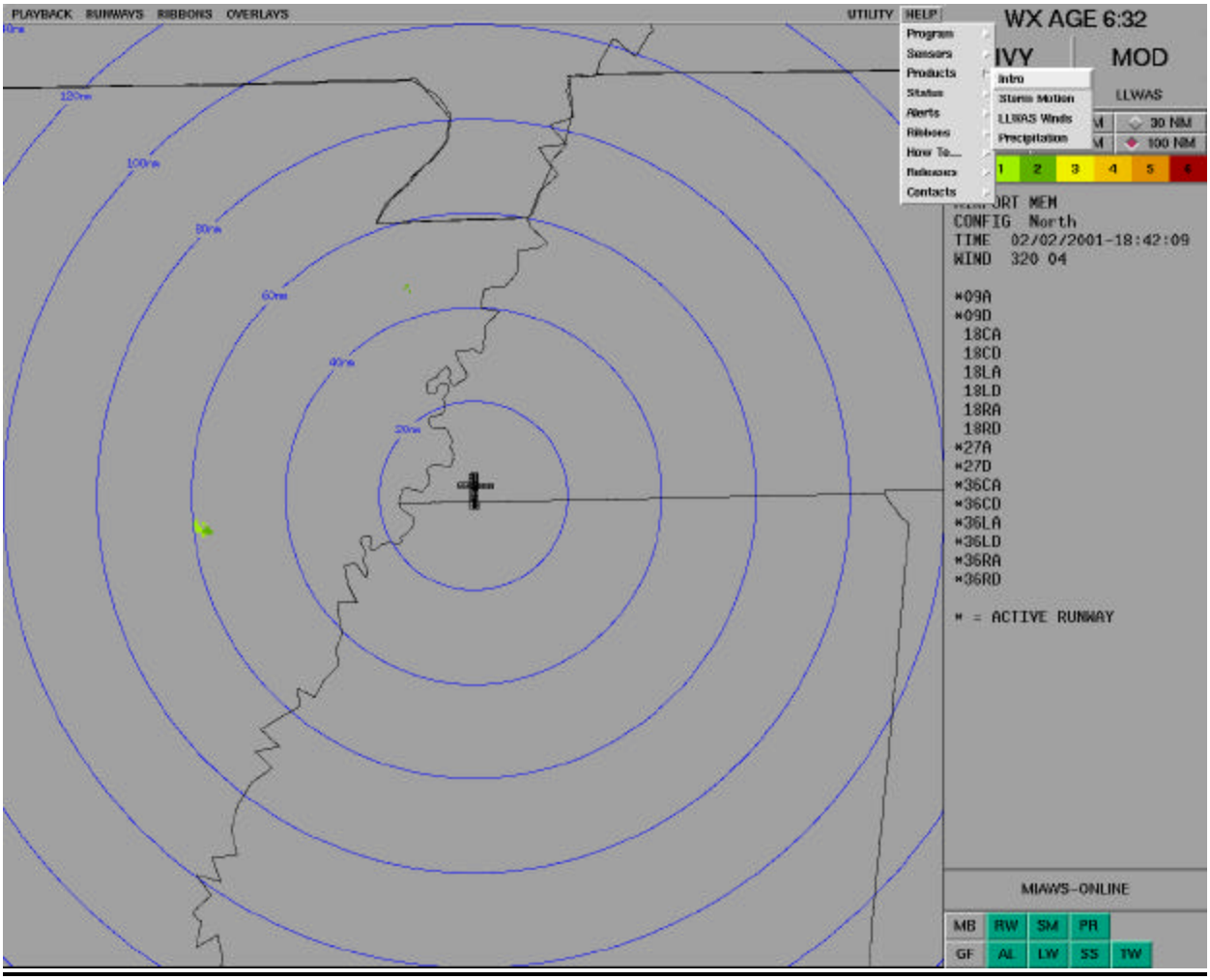

Figure 30-15: SD Pulldown Product Help Menu

30.2.3.11 SD Pulldown Status Help Menu

The SD Pulldown Status Help Menu shall be configured as in Figure 30-16. Associated submenus shall be provided as per the MIT/LL MIAWS Prototype. Processing associated with the Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

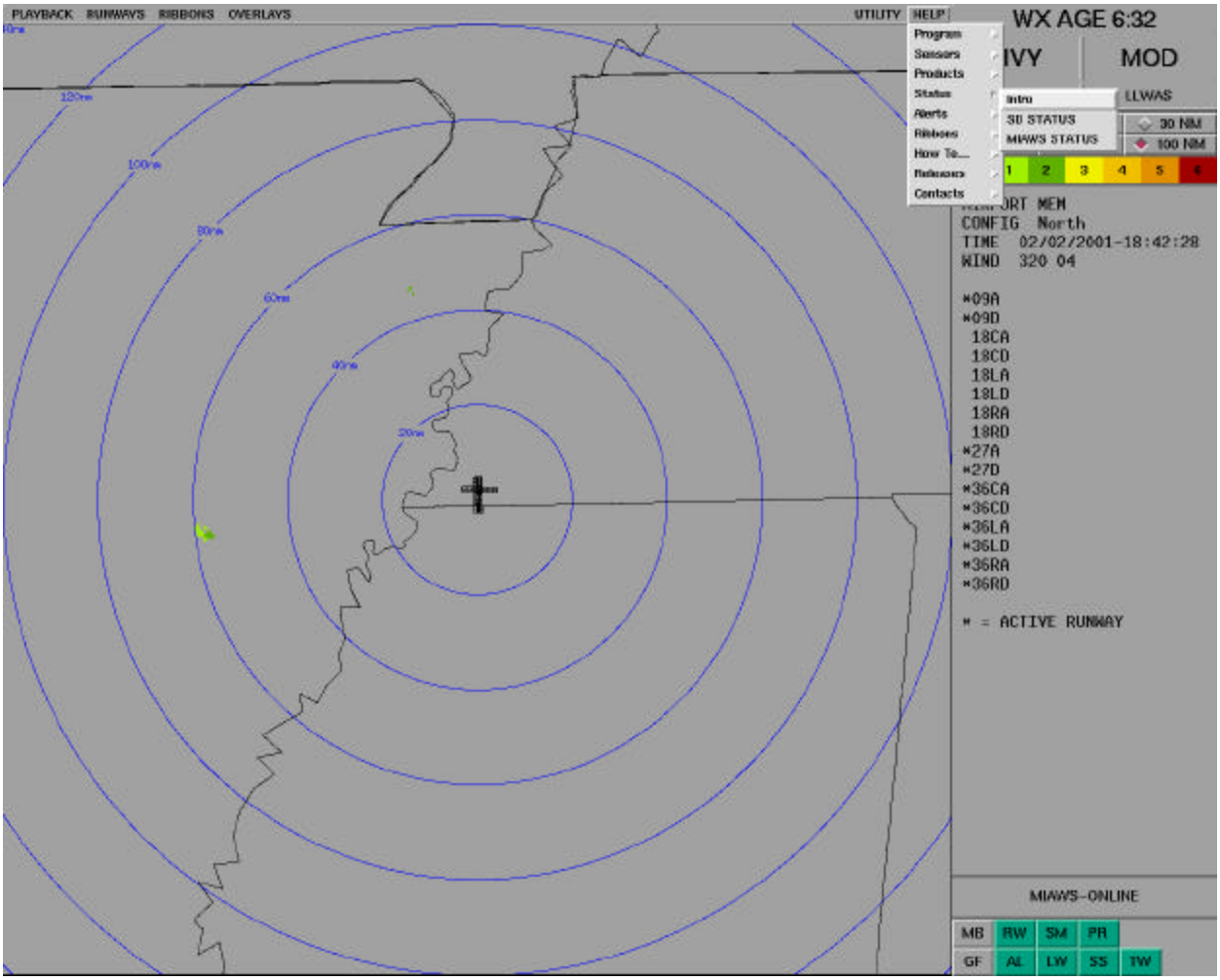

Figure 30-16: SD Pulldown Status Help Menu

30.2.3.12 SD Pulldown Help Menu for Alerts

The SD Pulldown Menu Help Menu for Alerts shall be configured as in Figure 30-17. Associated submenus shall be provided as per the MIT/LL MIAWS Prototype. Processing associated with the Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

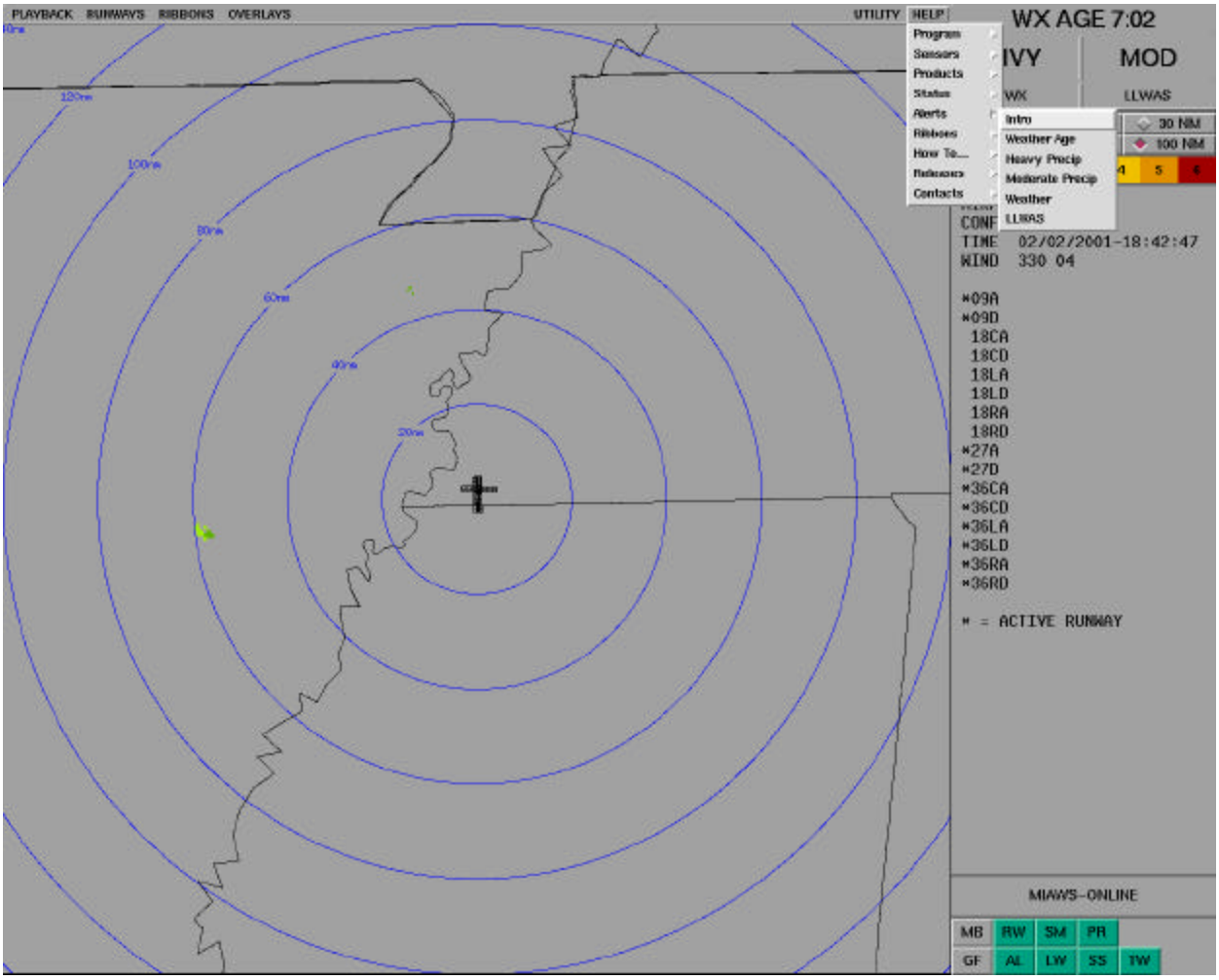

Figure 30-17: SD Pulldown Help Menu for Alerts

30.2.3.13 SD Pulldown Ribbons Help Menu

The SD Pulldown Ribbons Help Menu in Figure 30-18 shall be "grayed-out" (associated submenus and windows shall be disabled but retained in the delivered software as per the requirement in the last sentence of this section). Items to be "grayed out" shall include "Ribbons" on the left part of the help menu, and "Intro", "Ribbon Msg Formats", "Alerting Pilots", "Audible Warning", and "SD Impairment". These capabilities in the MIT/LL MIAWS Prototype GFP display algorithms that are not to be implemented in the flyoff version of MIAWS shall be disabled, but not removed, from the algorithms delivered as part of the flyoff version of the MIAWS software. Such modifications shall be identified to the Government during Design Reviews.

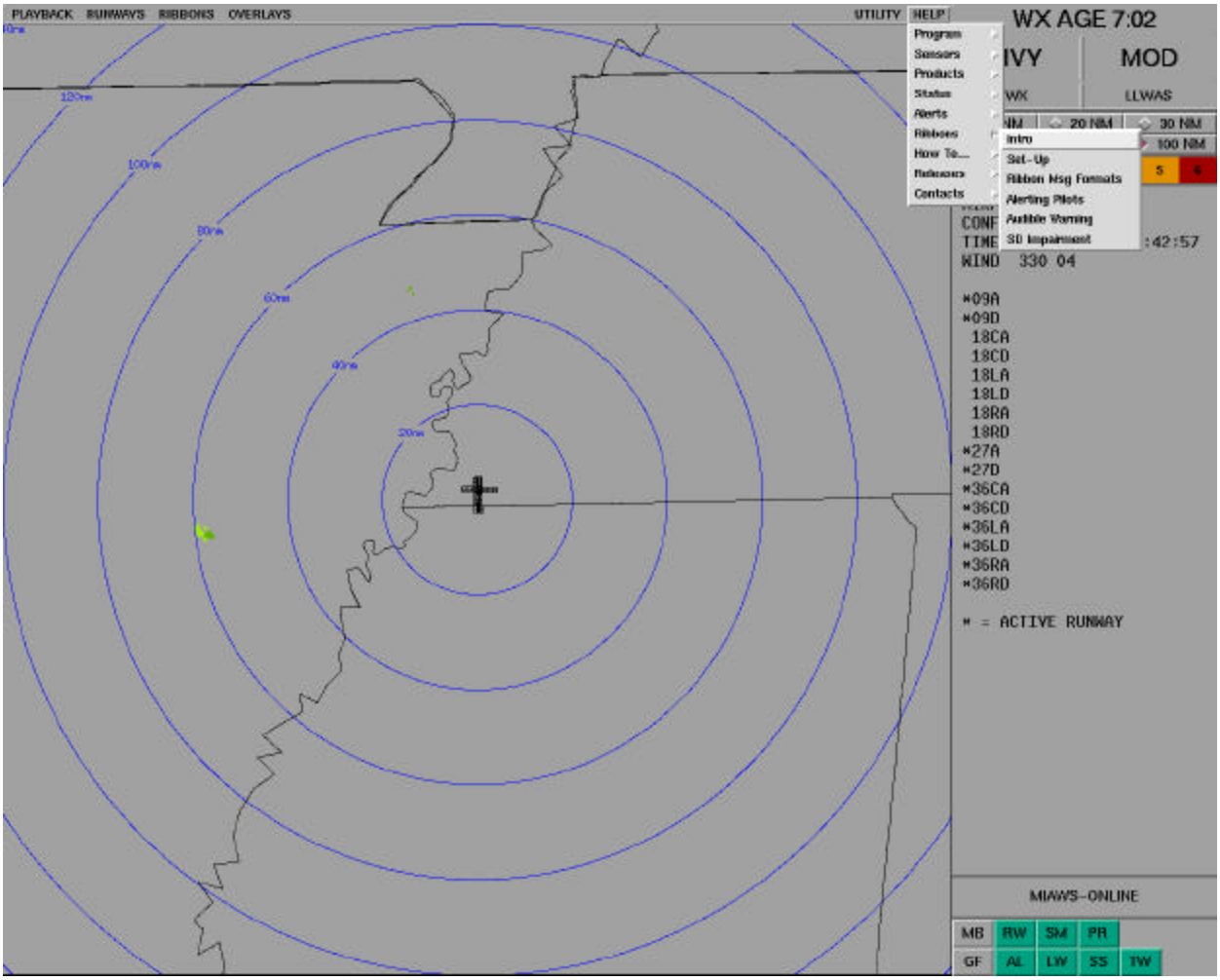

Figure 30-18: SD Pulldown Ribbons Help Menu

30.2.3.14 SD Pulldown "How To" Help Menu

The SD Pulldown "How To" Help Menu shall be configured as in Figure 30-19. Associated submenus shall be provided as per the MIT/LL MIAWS Prototype. Processing associated with the Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

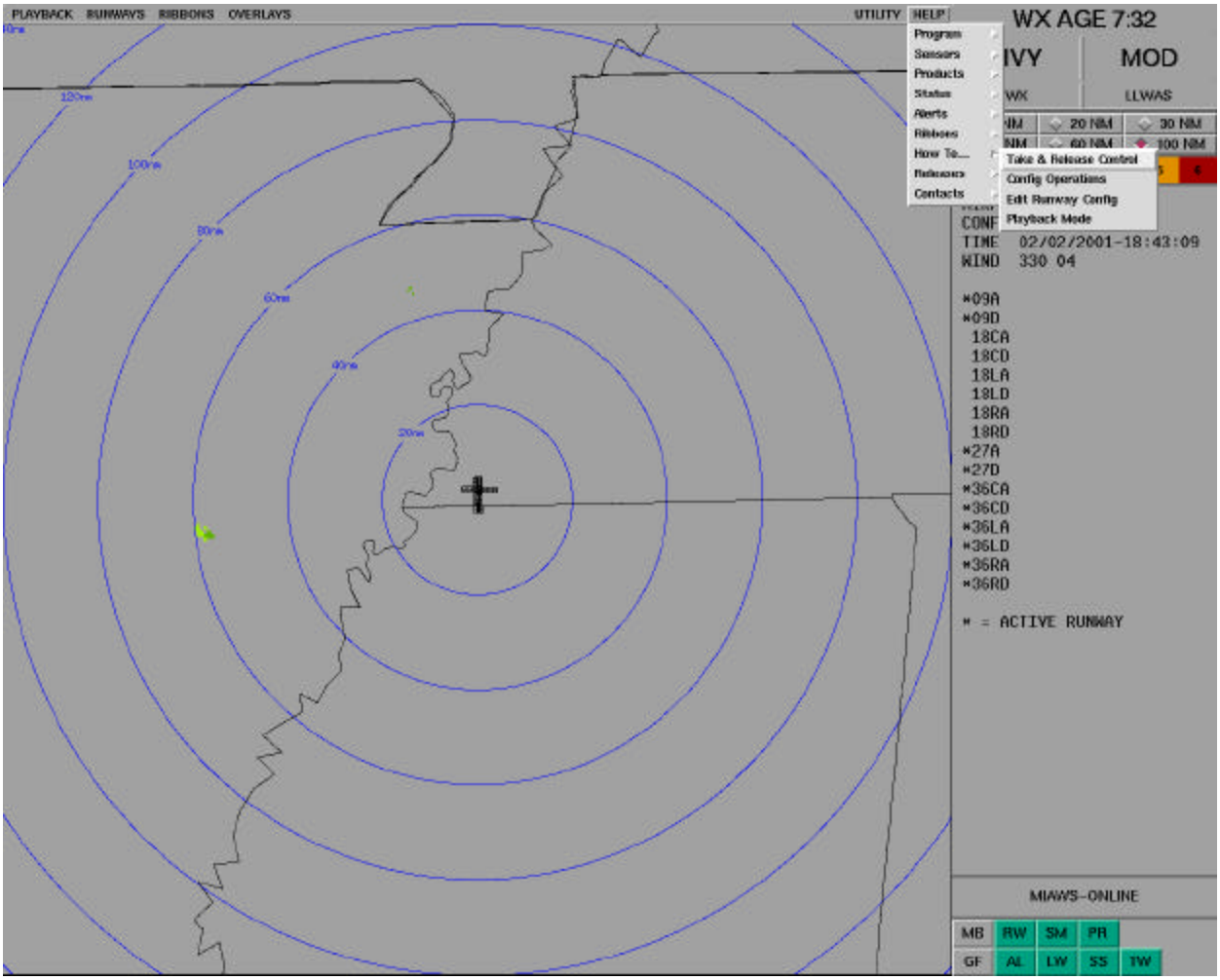

Figure 30-19: SD Pulldown "How To" Help Menu

30.2.3.15 SD Pulldown Releases Help Menu

The SD Pulldown Releases Help Menu shall be configured as in Figure 30-20. Associated submenus shall be provided as per the MIT/LL MIAWS Prototype. Processing associated with the Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

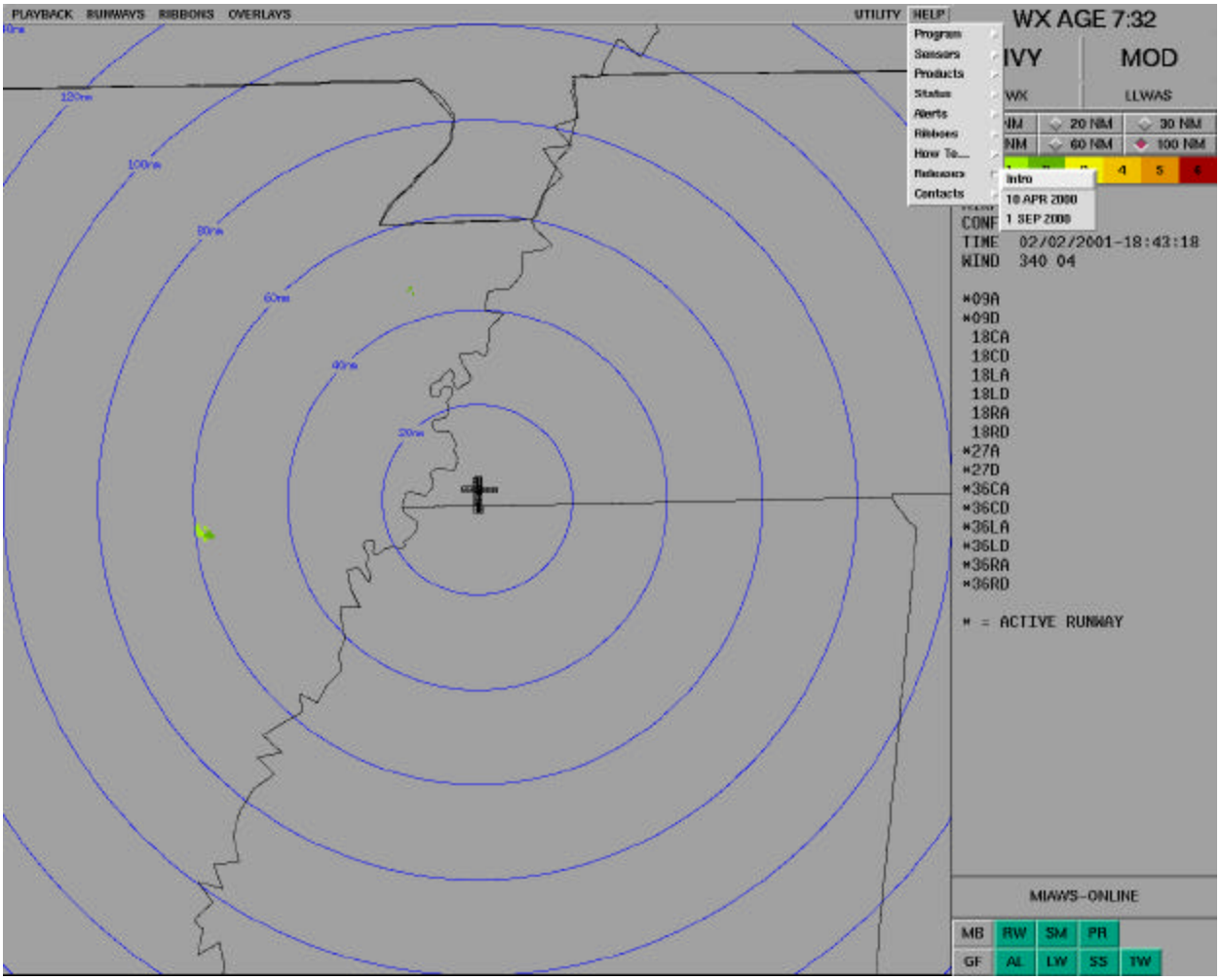

Figure 30-20: SD Pulldown Releases Help Menu

30.2.3.16 SD Pulldown Help Menu for Contacts

The SD Pulldown Menu Help Menu for Contacts in Figure 30-21 shall not be implemented. "Contacts" shall be removed from the Main Help Pulldown Menu, and the submenu for "MEM" and "JAN" shall not be implemented. These capabilities in the MIT/LL MIAWS Prototype GFP display algorithms that are not to be implemented in the flyoff version of MIAWS shall be disabled, but not removed, from the algorithms delivered as part of the flyoff version of the MIAWS software. Such modifications shall be identified to the Government during Design Reviews.

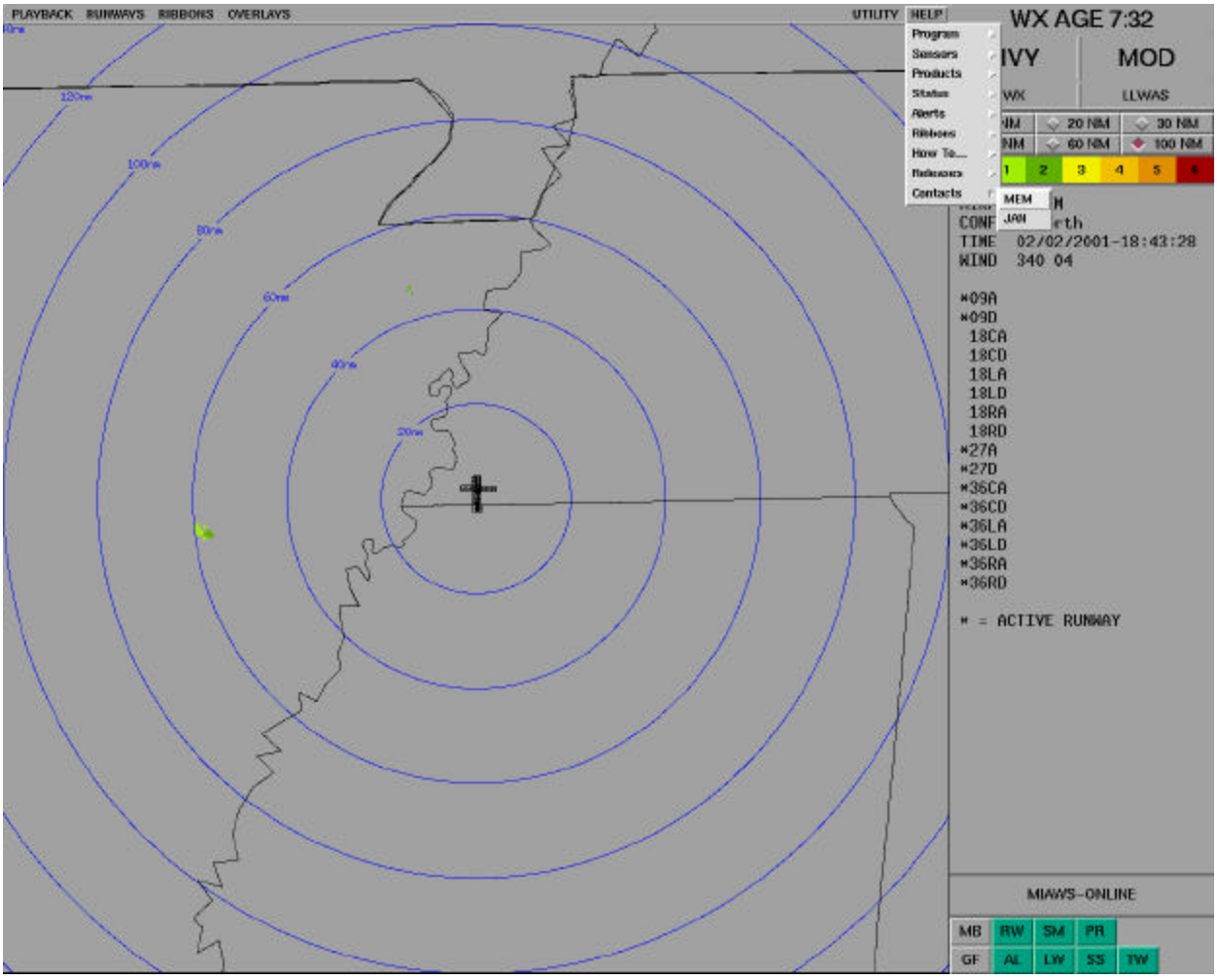

Figure 30-21: SD Pulldown Help Menu for Contacts

30.2.3.17 SD Background Pulldown Menu

The SD Background Pulldown Menu indicating shades of gray to be selected as the SD background, shall be configured as in Figure 30-22. Processing associated with the Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

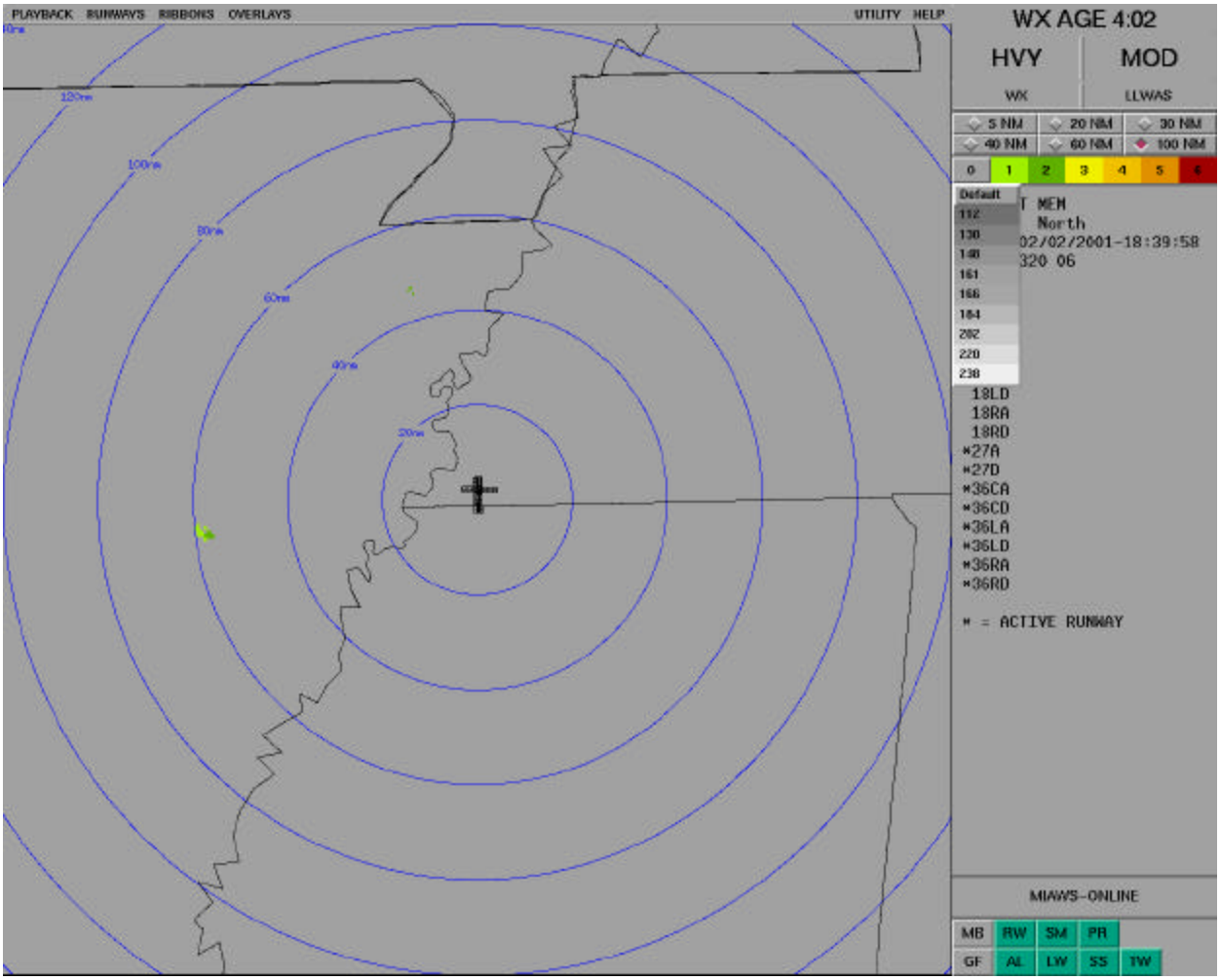

Figure 30-22: SD Background Pulldown Menu

30.2.4 Pop-Up Windows

30.2.4.1 Pop-Up SD Playback Control Window

The Pop-Up SD Playback Control Window shall be configured as in Figure 30-23. Processing associated with the Pop-Up Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

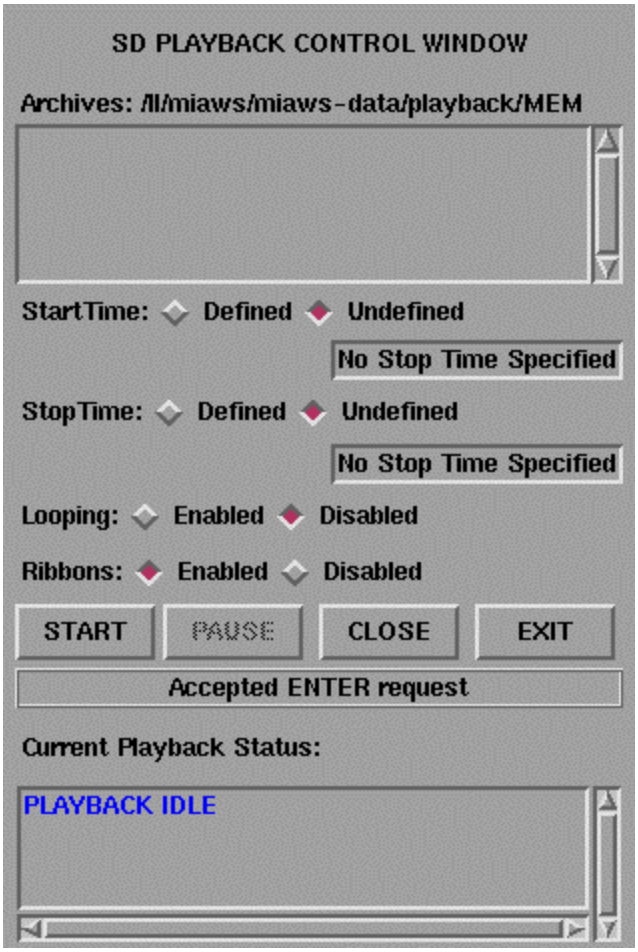

Figure 30-23: Pop-Up SD Playback Control Window

30.2.4.2 Pop-Up SD Control Window for Playback Start Time/Timestamp

The Pop-Up SD Control Window for Playback Start Time/Timestamp shall be configured as in Figure 30-24. Processing associated with the Pop-Up Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

Figure 30-24: Pop-Up SD Control Window for Playback Start Time/Timestamp

30.2.4.3 Pop-Up SD Control Window for Playback Stop Time/Timestamp

The Pop-Up SD Control Window for Playback Stop Time/Timestamp shall be configured as in Figure 30-25. Processing associated with the Pop-Up Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

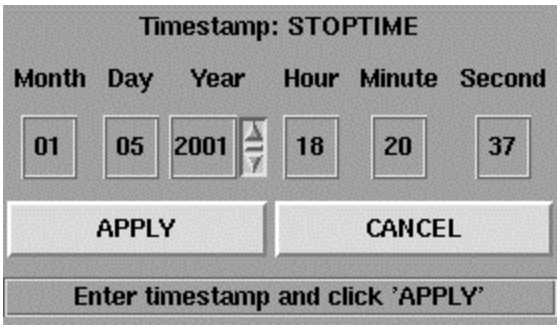

Figure 30-25: Pop-Up SD Control Window for Playback Stop Time/Timestamp

30.2.4.4 Pop-Up SD Runway Active Region Editor Window

The Pop-Up SD Runway Active Region Editor Window shall be configured as in Figure 30-26. Processing associated with the Pop-Up Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

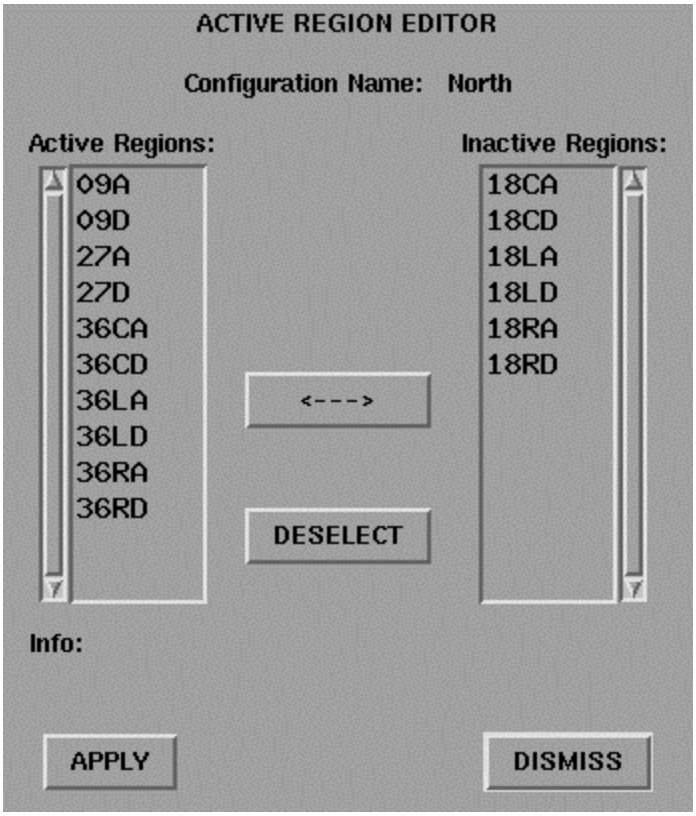

Figure 30-26: Pop-Up SD Runway Active Region Editor Window

30.2.4.5 Pop-Up SD Window for the Ribbon Display

The Pop-Up SD Window for the Ribbon Display shall be configured as in Figure 30-27. Processing associated with the Pop-Up Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

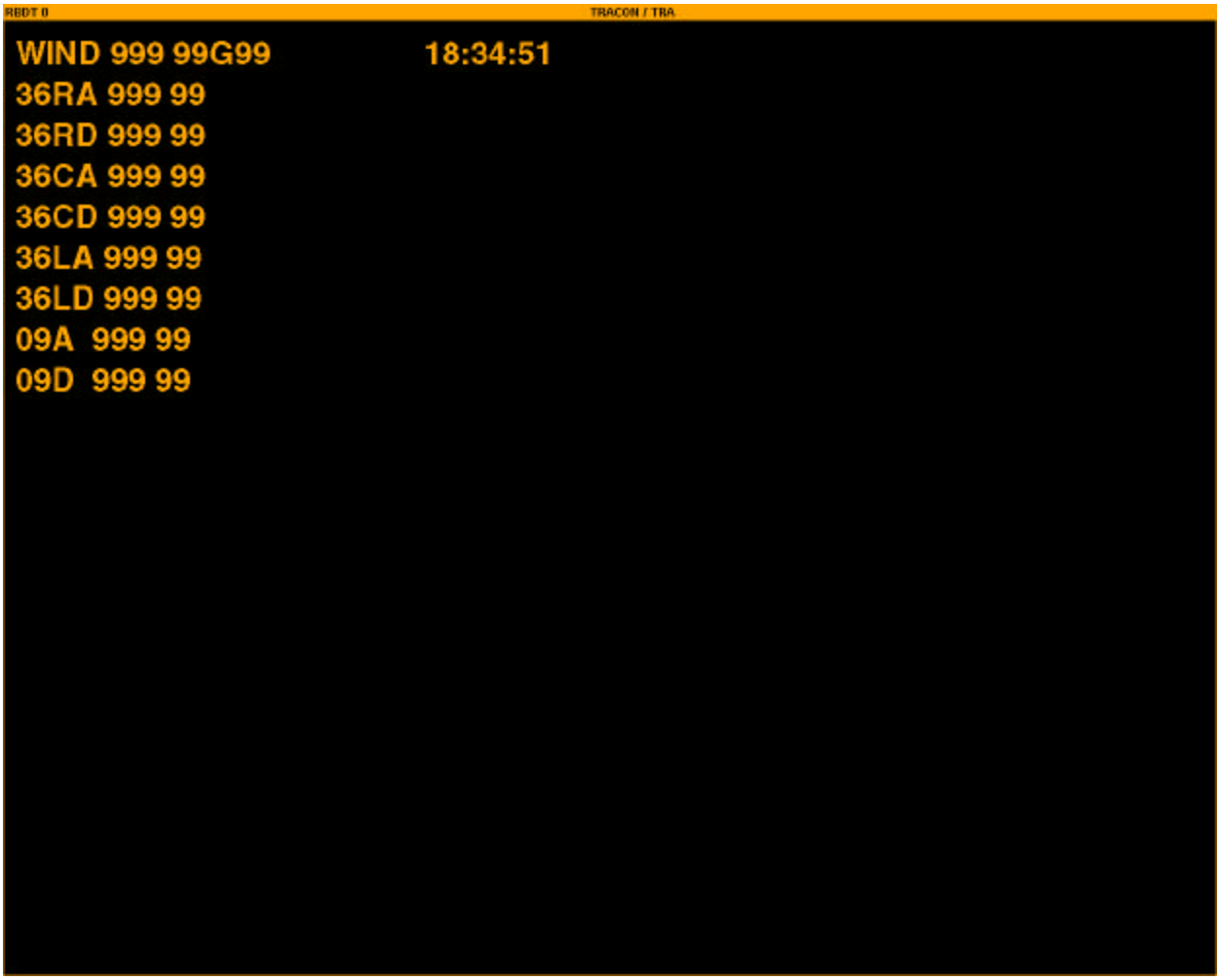

Figure 30-27: Pop-Up SD Window for the Ribbon Display

30.2.4.6 Pop-Up SD Runway Configuration Window

The Pop-Up SD Runway Configuration Window shall be configured as in Figure 30-28. Processing associated with the Pop-Up Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

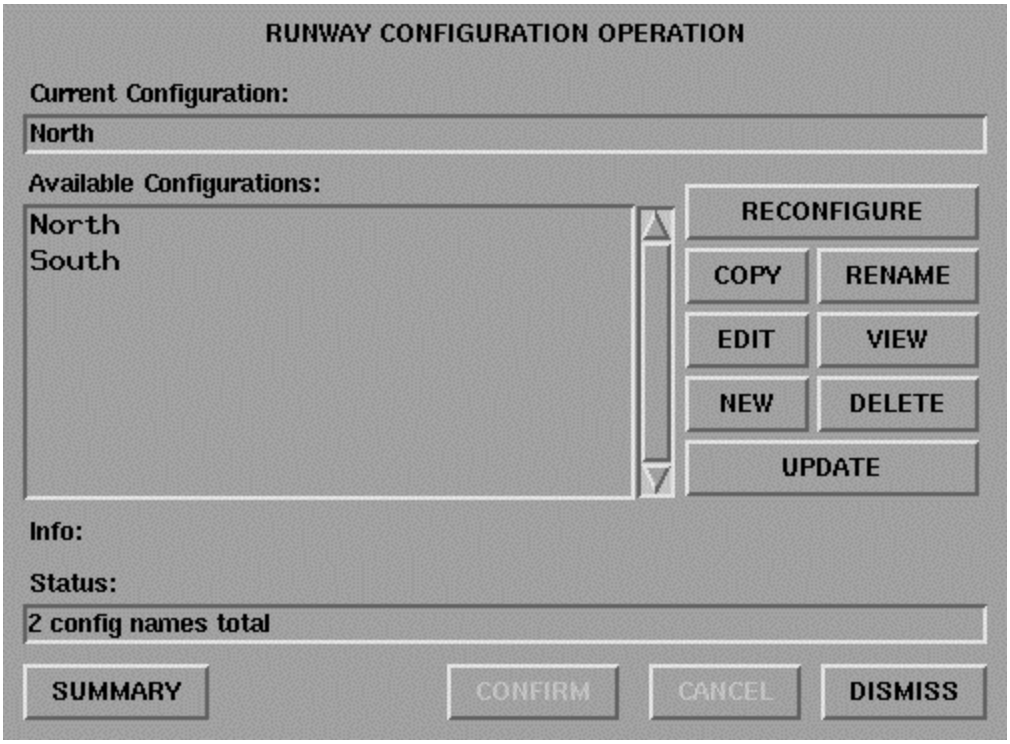

Figure 30-28: Pop-Up SD Runway Configuration Window

30.2.4.7 Pop-Up SD Runway Configuration Control Window

The Pop-Up SD Runway Configuration Control Window shall be configured as in Figure 30-29. Processing associated with the Pop-Up Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

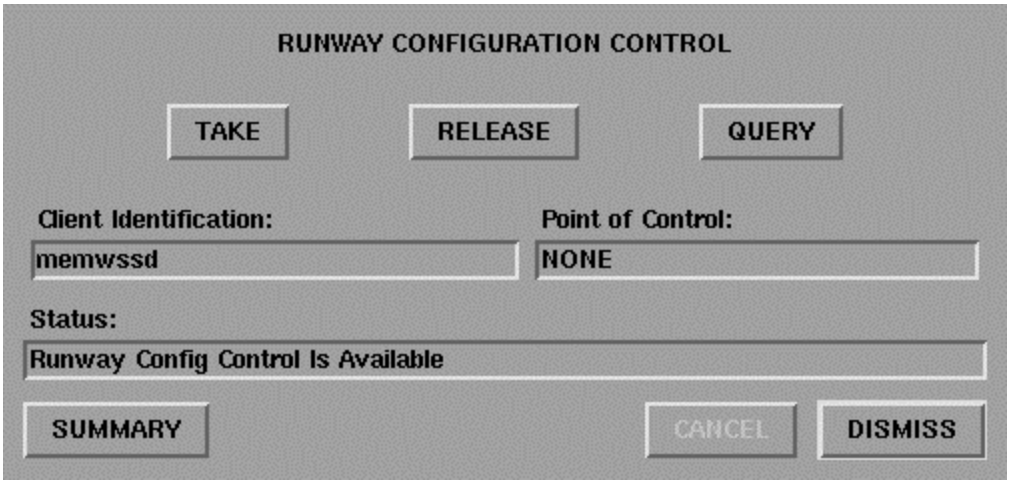

Figure 30-29: Pop-Up SD Runway Configuration Control Window

30.2.4.8 Pop-Up SD Runway Configuration Editor Window

The Pop-Up SD Runway Configuration Editor Window shall be configured as in Figure 30-30. Processing associated with the Pop-Up Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

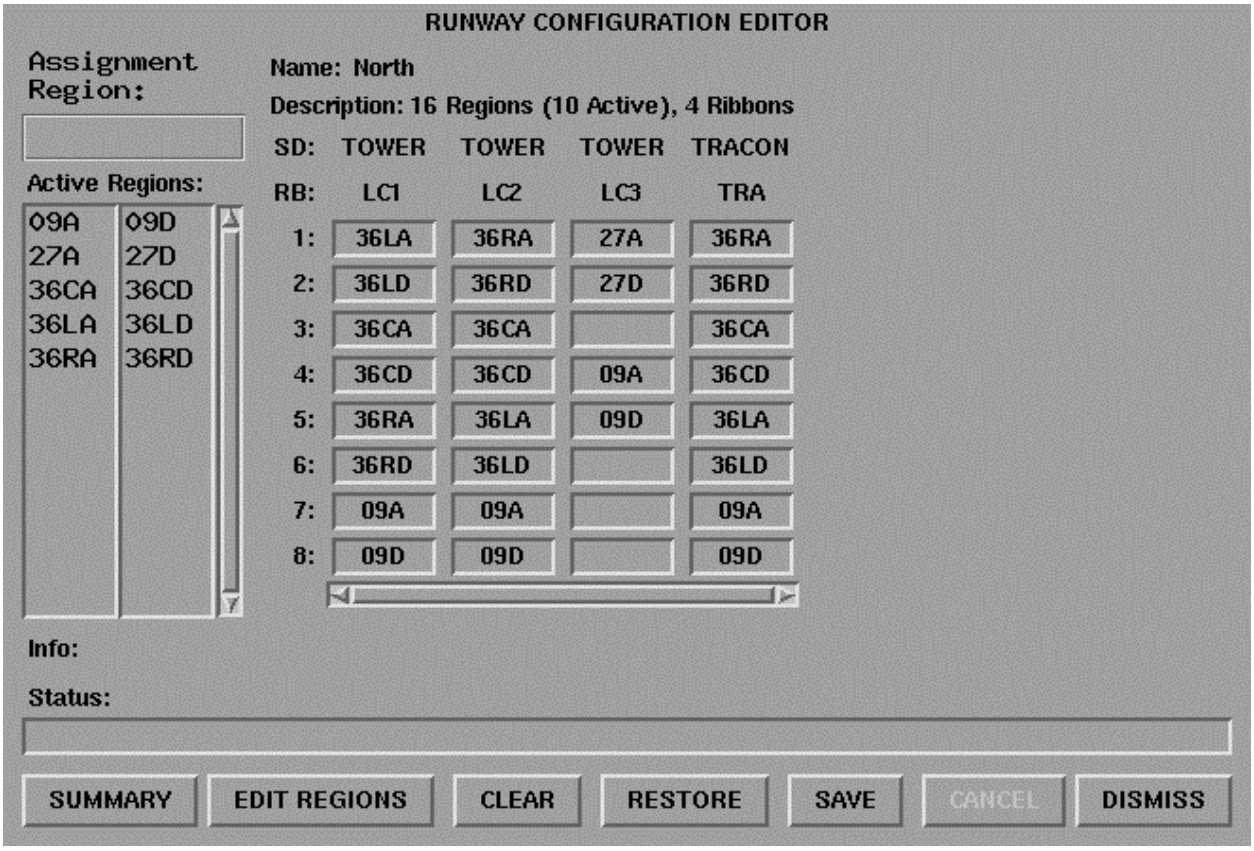

Figure 30-30: Pop-Up SD Runway Configuration Editor Window

30.2.4.9 Pop-Up Window for E-Mail

The Pop-Up Window for E-Mail in Figure 30-31 shall be not be implemented. The E-Mail capabilities in the MIT/LL MIAWS Prototype GFP display algorithms shall not be implemented in the flyoff version of MIAWS and shall be disabled, but not removed, from the algorithms delivered as part of the flyoff version of the MIAWS software. Such modifications shall be identified to the Government during Design Reviews.

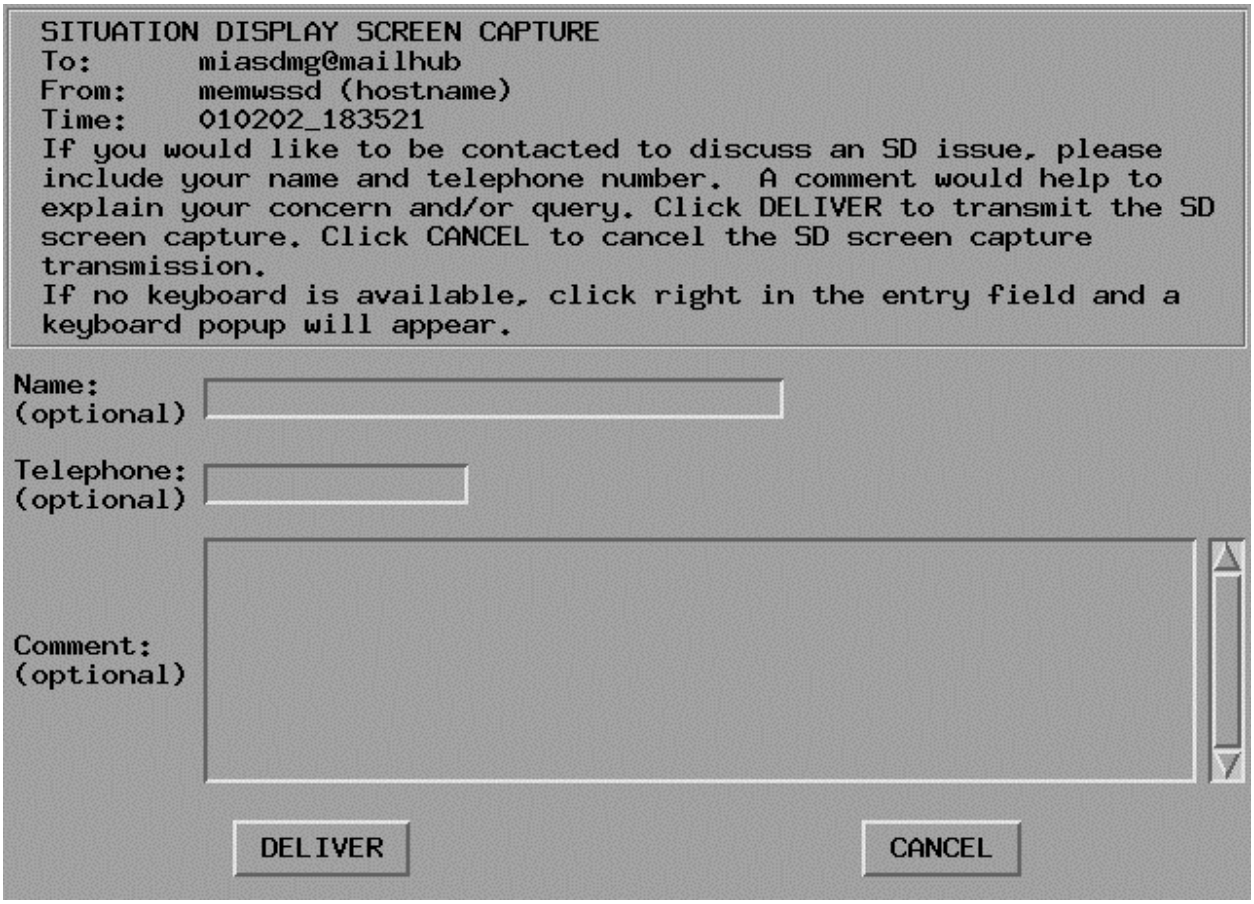

Figure 30-31: Pop-Up Window for E-Mail

30.2.4.10 Pop-Up SD Locator Window

The Pop-Up SD Locator Window shall be configured as in Figure 30-32. Processing associated with the Pop-Up Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

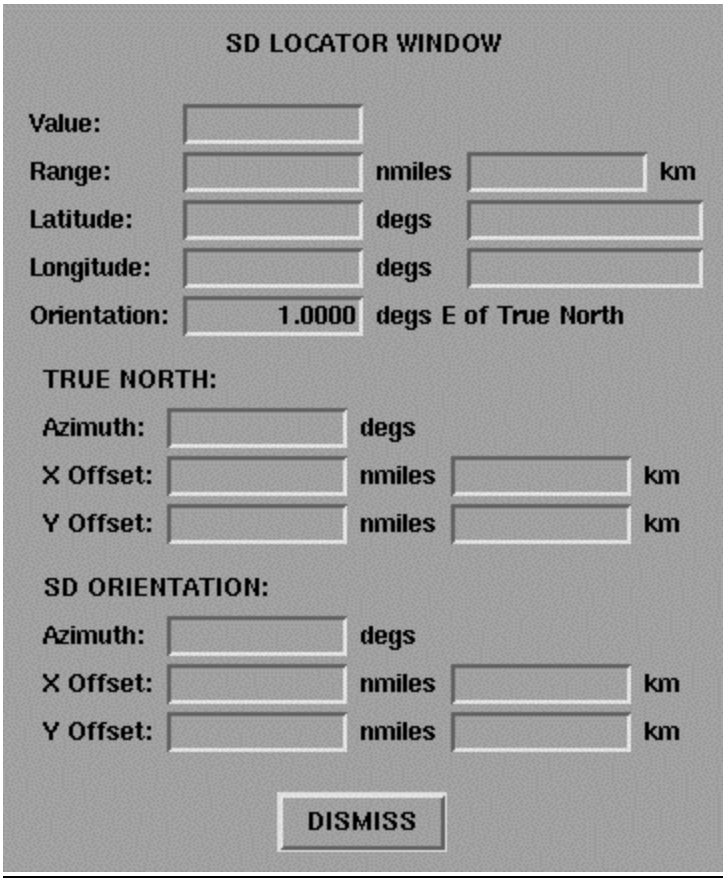

Figure 30-32: Pop-Up SD Locator Window

30.2.4.11 Pop-Up Window for Help

The Pop-Up Window for Help shall be configured as in Figure 30-33. Processing associated with the Pop-Up Window shall be provided as per the GFP Display algorithms of the MIT/LL MIAWS Prototype.

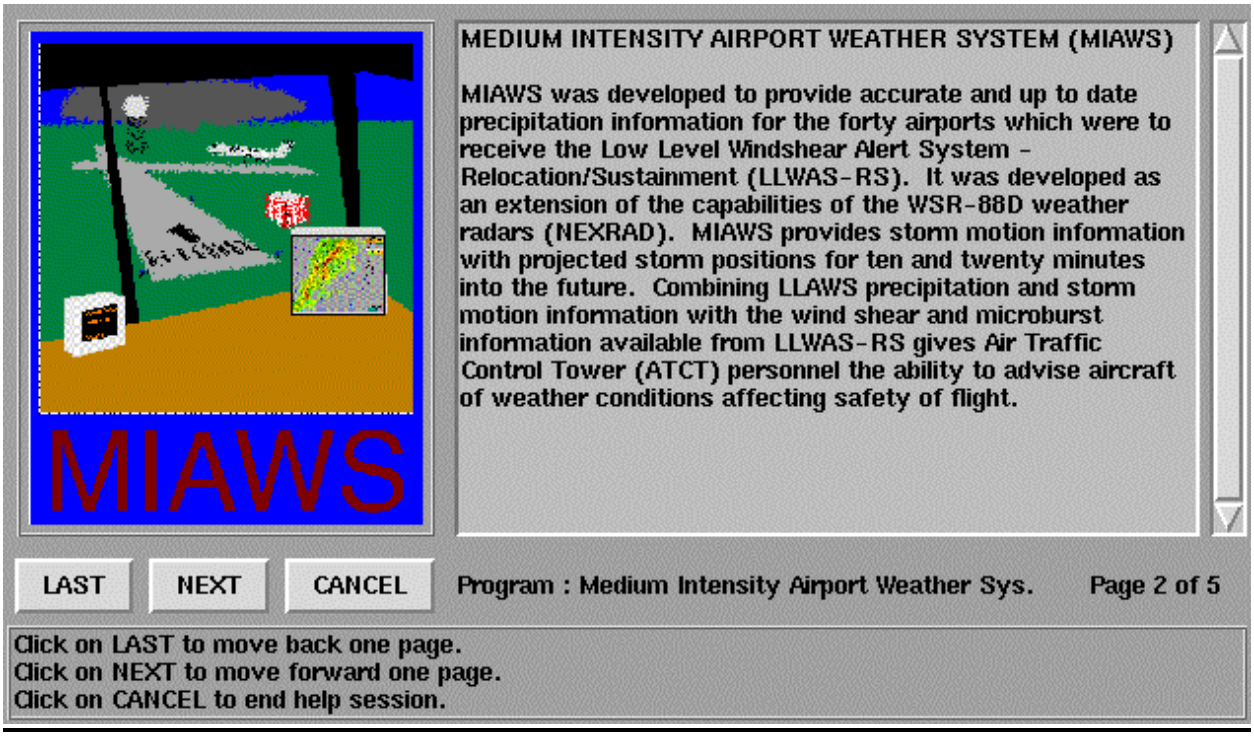

Figure 30-33: Pop-Up Window for E-Mail

30.2.4.12 Pop-Up SD Selection Storage Window

The Pop-Up SD Selection Storage Window in Figure 30-34 shall not be implemented. The SD Selection storage capabilities in the MIT/LL MIAWS Prototype GFP display algorithms shall not be implemented in the flyoff version of MIAWS and shall be disabled, but not removed, from the algorithms delivered as part of the flyoff version of the MIAWS software. Such modifications shall be identified to the Government during Design Reviews. Please reference Section 30.1.4 for requirements relating to retaining display settings upon recovery for power-down or inadvertent loss of power.

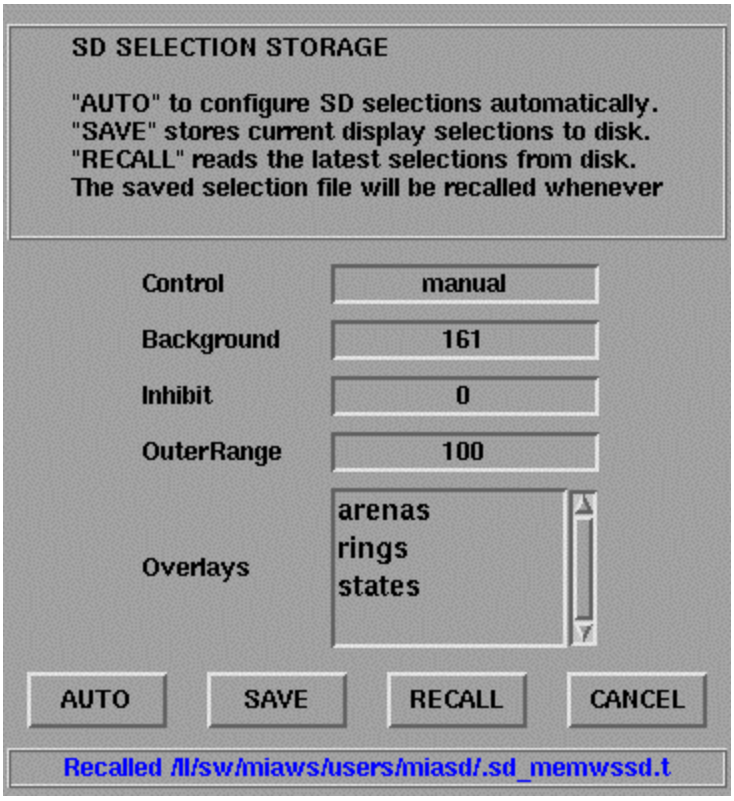

Figure 30-34: Pop-Up SD Selection Storage Window